

Management of Asbestos in Soils - An All-Ireland Guidance Document

Ireland Brownfield Network

Asbestos in Soils Good Practice Subgroup

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About the Ireland Brownfield Network

The Ireland Brownfield Network (IBN) was established in February 2012 by a collective of leading brownfield practitioners operating in various professions throughout Ireland. It is voluntarily run and organised by 14 committee members.

The Network aims to encourage constructive dialogue and interaction amongst all those involved in the redevelopment of brownfield land on the island of Ireland. In doing so, the collective learning experiences, good practice and effective strategies can then be shared and distributed.

The Network is free to join and open to all. Since its inception, the Network has run several free-to-attend conferences and networking events and has contributed to numerous government consultations relating to land contamination, planning, and waste - all with the view of improving the re-use of under-utilised lands throughout Ireland.

The IBN hopes that this document goes part-way to improving the AiS management of brownfield sites in Ireland so that the appropriate and sustainable revitalisation of under-utilised sites is facilitated.

Disclaimer

This document is made freely available on the understanding that the authors and both current and past members of the IBN committee and steering groups hold neither liability nor responsibility to any person or entity with respect to any loss or damage arising from its use. Whilst every effort has been made to ensure the contents are accurate and complete, the IBN and the stated document authors offer no warranty or reliance, either collectively or as individuals, that could occur as a result of referring to this document.

1 Introduction

Asbestos in soils (AiS) represents potential legal, financial and reputational liabilities for brownfield redevelopment projects as it can pose risks to human health and can add considerable cost through the need to manage in-situ or dispose off-site.

Understanding the hazard that is asbestos, and the potential risks that it represents when present in soil, is a critical aspect of delivering a sustainable and safe redevelopment project.

In recent years, several industry led AiS guidance documents have become accessible to the developer and other stakeholders in both jurisdictions in Ireland¹. Following their publications, the primary aim of this document is to signpost the main legislation, guidance documents and good practice approaches applicable throughout the island of Ireland into a single and harmonised location.

Although there are two very distinct legal regimes governing AiS on the island of Ireland, the management and control of risks present on brownfield sites share many common parallels. The objective of this document is to act as an AiS reference guide for practitioners and developers, and to raise awareness of asbestos in soils by highlighting legal requirements and appropriate mitigation measures so that brownfield development is delivered in a sustainable and safe manner. We hope that this reference guide for practitioners and developers will enable safe and sustainable brownfield development by raising awareness of asbestos in soils through highlighting the relevant legal requirements and appropriate mitigation methods.

1.1 About this Guide

This guide gives an overview of main considerations in relation to AiS. The document is based on existing information, legislation and industry good practice guidance that would be relevant to sites across the island of Ireland.

¹ Both jurisdictions refer to the Republic of Ireland (ROI) and Northern Ireland (NI).

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This guidance aims to provide a high-level overview of the following:

- What asbestos is, how it was used and where it can be found below ground;
- The primary and secondary legislation in place in both the Republic of Ireland (ROI) and Northern Ireland (NI);
- Existing good practice guidance relevant to Ireland;
- Site investigation techniques and laboratory analysis for AiS;
- Methods for assessing risks to human health;
- The handling, classification and disposal of waste soils containing asbestos; and,
- The remediation of sites where asbestos in soils represents an unacceptable risk.

This guide does not cover the management of asbestos above ground i.e. within buildings and their sub-structures.

For clarity, 'soils' are defined for the purposes of this guide as strata, either naturally occurring or anthropogenically influenced (such as Made Ground), that lies immediately beneath a built structure (including the hardstanding such as floor-slabs, roads and pavements) or is exposed at the surface as soft landscaping or bare ground cover.

The guidance presents each chapter in tabulated formats, listing the main pieces of legislation or referenced documentation in date order. Accompanying each entry is a brief summary as to how it specifically relates to AiS in Ireland. Readers should not rely on these summaries in their entirety and are advised to familiarise themselves with the documentation referenced so that the information is correctly applied. In recognition of the two distinct legal regimes, each document is preceded with an X or C where:

X = Demonstrates that document or legislation relates specifically to a particular jurisdiction; and

C = Denotes a document that could have relevance to both jurisdictions and, in the absence of anything else relevant to that jurisdiction, it could be argued that the document represents industry good practice and should therefore be considered.

1.2 Notes for Developers

This guide is aimed at the brownfield developer, contaminated land practitioner, environmental consultant and regulatory bodies responsible for ensuring redeveloped sites are suitable for their intended end-use. The IBN hopes that site owners and developers can utilise this guide to help to reduce their cost exposure and mitigate against the potential risks posed by AiS.

Prior to progressing with the purchase or development of a brownfield site, the IBN recommends that specialist site-specific advice is sought. Developers and landowners should satisfy themselves that those providing the advice are suitably competent, qualified and insured to deal with AiS.

As a note of caution, many standard Professional Indemnity insurance policies exclude claims relating to asbestos. Requesting demonstrated proof that appropriate insurance that covers AiS is in place prior to commissioning advisors is therefore highly recommended.

Throughout this document, reference is made to Competent Practitioners. In the absence of an industry recognised bench marking qualification for the land contamination discipline, the IBN considers a Competent Practitioner to be someone with a recognised relevant qualification, who has sufficient demonstrable experience in assessing and managing the risks presented by AiS, and is preferably a Chartered, or equivalent, member of a relevant professional organisation.

2 Background

2.1 What is Asbestos?

Asbestos is a naturally occurring fibrous silicate mineral created under extreme temperatures and pressures associated with igneous and metamorphic action. The most commonly mined asbestos types are chrysotile, amosite and crocidolite (also referred to as white, brown and blue asbestos).

Its structure presents numerous beneficial physical properties; its tensile strength and ability to act as effective heat and sound insulation has resulted in its extensive use within the construction industry. Although its use in construction materials was banned in both jurisdictions between 1999 and 2000, asbestos remains present within buildings and its appropriate management is therefore governed by legislation. In the ROI, the control of asbestos is predominantly regulated by the Health and Safety Authority (HSA), and in NI by the Health and Safety Executive Northern Ireland (HSENI).

Asbestos is known to cause fatal lung cancer and mesothelioma, pleural thickening, and asbestosis. In the ROI between 1994 and 2010, an average of 24 people per annum died from mesothelioma. This is set to double by 2020. In NI in 2015, there were 43 deaths caused by mesothelioma, with a further 27 deaths being caused by asbestosis. Therefore, Ireland-wide asbestos related deaths will soon exceed 100 per annum. Current evidence suggests that around 85% of all mesotheliomas in males are attributable to asbestos exposures that occurred in occupational settings, with most of those being in the construction industry.

During the construction and demolition of buildings, asbestos-containing materials and fibres can be introduced to soils. Similarly, asbestos may be present within Construction and Demolition (C&D) materials (crushed concrete, bricks, etc.) that are often present on the surface of Brownfield sites but outside built structures. Asbestos can also be found in buried waste or stockpiled waste on both Brownfield sites and Greenfield sites.

2.2 Where Asbestos is Found

In its natural state, asbestos has been mined across the globe (most notably in Canada, South Africa, Australia, Italy, Cyprus, Corsica, Russia, China, Brazil and Kazakhstan). Minor natural occurrences of asbestos minerals have been documented across Ireland by Geological Survey Ireland and there has been at least one documented occasion where it has been inadvertently extracted during quarrying activities².

Between 1950 and 1980, the UK imported 2.7 million tonnes of chrysotile (white), 0.5 million tonnes of amosite (brown) and 50,000 tonnes of crocidolite (blue). This raw product was then manufactured into various products, the most common being:

- Cement products (roofing sheets, gutters and drainpipes, soffits, water tanks, etc);
- Insulation (lagging, sprayed coatings, electrical boards, gaskets, etc);
- Textiles (rope, cloth, woven products, etc);
- Household products (toilet seats and cisterns, vinyl floor tiles, Bakelite, etc); and,
- Decorative products (Artex, paint, putties, adhesives, etc).

These products were extensively used in the construction industry until the importation, supply and use of all forms of asbestos was banned in 1999-2000. Due to the prevalence of these products within the supply chain, it is thought that asbestos-containing products continued to be used for several years after 1999-2000. Consequently, it can be assumed that all buildings in Ireland constructed before and immediately after the ban will contain asbestos to some degree.

² <https://brownfieldbriefing.com/47864/asbestos-scare-over-wicklow-building-materials>

2.3 Asbestos Occurrence in Soil

During the construction, management and demolition of buildings, the asbestos within structures has the potential to be spread in the soil environment. Asbestos is commonly found in Made Ground material, present in soil, or as buried waste, as fragments of Asbestos Containing Materials (ACMs). Consequently, AiS must be assumed to be present (unless proven otherwise) on all Brownfield sites where the site's previous use has pre-dated the ban, or where material has been imported prior to, or post-development.

In addition, AiS can also be present in Greenfield sites where past activities such as waste disposal, land raising and the laying of materials for tracks, pathways and to improve drainage, have occurred.

3 Legislation and Regulation

Introduction

Relevant legislation and regulations comprise those specifically relevant to asbestos, such as the Control of Asbestos (Northern Ireland) Regulations (2012), and that which is relevant by proxy, such as waste and health and safety legislation that dates back to 1887 (before the detrimental health effects of asbestos were understood).

The following table provides a date-ordered list of current (at time of publication) legislation from both jurisdictions that may have a bearing on AiS. The list serves to guide readers to the most relevant and current legislation that may govern AiS. It may not be exhaustive, and legislation is continuously evolving and changing. Readers are reminded that, post-January 2021, the UK-EU Withdrawal Agreement may have a bearing on that legislation relevant to Northern Ireland. Consequently, readers must therefore satisfy themselves that they are fully informed of their legal responsibilities prior to dealing with AiS. The IBN would recommend that developers and their advisors should seek up to date legal advice to clarify their respective legal positions in relation to AiS.

ROI	NI		Legislation	Lead Authority	Summary of relevance to AiS
X	X	Pollution Control	Public Health (Ireland) Act 1887	Local Authority	Empowers local authorities to serve abatement notices on landowners where an accumulation or deposit of AiS is deemed to cause a nuisance or is injurious to health.
X			Air Pollution Act, 1987	Local Authority	Local authorities are responsible for investigating any incidents of air and water pollution in their areas (including the incorrect disposal of asbestos) and can then prosecute any infringements.
	X		Waste and Contaminated Land (NI) Order 1997	Local Authority	Part III is yet to be commenced, but the Order does provide the legal definition for when AiS is determined to be present to such an extent that Significant Possibility of Significant Harm (SPoSH) could occur - and

ROI	NI		Legislation	Lead Authority	Summary of relevance to AiS
					therefore when a site meets a legal definition of being 'Contaminated Land'.
	X		Pollution Prevention and Control Regulations (NI) 2003	Northern Ireland Environment Agency	Lists asbestos as a main polluting substance should it be released to air and requires AiS works that could result in asbestos release to be permitted under Part A permitting regime.
	X		Compensation Act 2006	N/A	Allows for joint and several liability provisions should landowners, organisations and individuals be found negligent in the way AiS is managed.
	X		The Environmental Liability (Prevention and Remediation) Regulations (NI) 2009	Northern Ireland Environment Agency	Should a release of asbestos to soils and the environment have occurred after 24 th July 2009, clean up to background concentrations may be enforced.
	X		Planning (NI) Order 2011	Local Authority	Where AiS is present to the extent that it is determined to be a hazardous substance either on, over or under a site, the development of that land will require the consent of the local Council prior to Planning Permission being granted.
	X		Clean Neighbourhoods and Environment (NI) Act 2011	Local Authority	Should accumulations or deposits of AiS be deemed to be prejudicial to health, these may be deemed a statutory nuisance resulting in enforcement action.
	X	Asbestos Specific	Control of Asbestos Regulations (Northern Ireland) 2012	Health and Safety Executive NI	Requires employers and clients to prevent or minimise exposure to AiS for workers and for the public close to development sites.

ROI	NI		Legislation	Lead Authority	Summary of relevance to AiS
	X	Workplace Health and Safety	Health and Safety at Work (NI) Order 1978	Health and Safety Executive NI	Places a duty on employers to ensure, so far as is reasonably practicable, the health, safety and welfare at work of all their employees.
	X		Reporting of Injuries, Diseases and Dangerous Occurrences Regs (NI) 1997	Health and Safety Executive NI	Should AiS be released during work activities to such an extent that damage to human health may occur, such events are reportable to HSENI as 'dangerous events'.
X			Safety, Health and Welfare at Work Act, 2005 (S.I. No. 10 of 2005)	Health and Safety Authority	This Act clarifies and enhances the responsibilities of employers, the self-employed, employees and various other parties in relation to safety and health at work.
X			Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006 (S.I. No. 386 of 2006 and 2010 amendments (S.I. 589 of 2010))	Health and Safety Authority	These are the key Regulations relating to asbestos in the workplace and apply to activities in which employees are, or are likely to be, exposed to dust arising from materials containing asbestos. The Regulations require employers to undertake risk assessments and to lay down measures to ensure the safety and health of employees. The Regulations provide a single exposure limit value for all work activities where exposure to asbestos dust in the air at a place of work may arise. The Regulations also emphasise the need for adequate training.
X			Safety, Health and Welfare at Work (Construction) Regulations 2013	Health and Safety Authority	Relates mainly to the renovation, repair and demolition of older buildings where asbestos may have been used, and specifically requires contractors to reduce dust levels to levels not dangerous or injurious to health. Requires contractors to draw up H&S Plans to minimise the risks should asbestos-containing materials be present, and execute that plan throughout the works.

ROI	NI		Legislation	Lead Authority	Summary of relevance to AiS	
	X		Construction (Design and Management) Regulations (Northern Ireland) 2016	Health and Safety Executive NI	Defines the roles and responsibilities for those in construction to suitably manage AiS, re-affirms general principle of preventing exposure to asbestos, and places legal duty on all involved in a site's redevelopment to minimise asbestos exposure.	
X		Waste Legislation	Waste Management (Hazardous Waste) Regulations, 1998 (S.I. No. 163/1998)	Environmental Protection Agency	Any company that collects asbestos or AiS considered Hazardous waste must: have an up to date Waste Collection Permit, have the proper facilities to transport and dispose of the waste, and ensure that no fibre or dusts are emitted or released.	
X			Waste Management Act 1996 (as amended)	Environmental Protection Agency	AiS waste disposal and recovery activities are required to hold authorisation that they are either an exempted activity (i.e. no authorisation is required), or hold a Waste (or IPPC) licence, a Waste Facility Permit, or a Waste Certificate of Registration. Depending on the authorisation required, these activities are controlled either by the Environmental Protection Agency (EPA) or by Local Authorities.	
	X			The Controlled Waste (Registration of Carriers and Seizure of Vehicles) Regulations (Northern Ireland) 1999	Northern Ireland Environment Agency	Details the registration requirements of those transporting AiS wastes and the seizure powers of the Department should an offence be suspected.
	X			Controlled Waste (Duty of Care) Regulations (Northern Ireland) 2002	Northern Ireland Environment Agency	Defines the nature and responsibility of the transferor and transferee with regards to controlled waste that includes soils contaminated with asbestos fibres with a concentration greater than 0.1%w/w. Controlled waste is any waste that is subject to legislative control.

ROI	NI		Legislation	Lead Authority	Summary of relevance to AiS
X			Council Decision 2003/33/EC establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC	Environment Protection Agency	Establishes the criteria and procedures for the acceptance of granular waste (AiS) at landfills and, where circumstance is appropriate, permits the disposal of AiS in Non-hazardous landfills.
	X		Waste Management Licensing Regulations (NI) 2003	Northern Ireland Environment Agency	Determine whether AiS activities need a Waste Management Licence or whether activities meet the criteria to allow the activity to be registered as exempt.
	X		Hazardous Waste Regulations (Northern Ireland) 2005	Northern Ireland Environment Agency	Should AiS wastes be deemed Hazardous, this legislation controls the disposal and correct management of asbestos from its production to final disposal.
	X		The Transfrontier Shipment of Waste Regulations 2007	Northern Ireland Environment Agency	Those regulations that govern the transportation of AiS into, out of or through the United Kingdom.
	X		The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009	Northern Ireland Environment Agency	Controls the movement of AiS waste should it be determined to be Hazardous.
	X		The Waste Regulations (Northern Ireland) 2011	Northern Ireland Environment Agency	Encourages the use of the waste hierarchy when dealing with AiS to protect the environment and human health from the adverse impacts of asbestos.

4 Site Investigation

The potential for AiS to be present depends on the nature of the site, its land use and site history. As a result, there is generally a need to at least consider its presence on any Brownfield site or piece of land on which there is evidence of human influence.

In most disciplines, the site investigation regime is undertaken in a phased approach that starts with a preliminary or desktop-type assessment where available information on the site's history and/or land use is reviewed in order to consider the potential for asbestos to have been introduced. Where there is the potential for ACMs to have been present in any existing or past structure, or through imported materials, there is also the potential for asbestos to be introduced into the soil matrix.

Following any desk-based assessment where the potential for asbestos to be present has been identified, often some form of intrusive investigation and quantitative risk assessment is then required. This can involve Competent Practitioners visually inspecting soils or stockpiles, and the taking of samples for laboratory analysis and, possibly, quantification. The use of this data depends on the nature of the assessment being undertaken, for example, where an assessment is being undertaken to support a development, or for classifying material for reuse or off-site disposal.

The following sections provide further information regarding this phased approach to site investigation, whilst risk assessment is covered in detail in Chapter 5 of this document.

4.1 Preliminary Risk Assessment

The first step in completing a preliminary risk assessment is undertaking a desktop study that considers the site history and the potential source of asbestos. This is covered in more detail in Chapter 5.

A desk-study can comprise many elements, including, but not limited to, the following:

- A review of geological and historic ordnance survey maps to determine the potential presence of artificial/Made Ground that has the potential to contain asbestos;
- A review of as-built and existing construction plans to identify locations that have the potential to contain asbestos. Examples include, but are not limited to, boiler rooms and houses, and service runs;
- Fact-finding interviews with the site owner, employees and maintenance staff to appraise the development, maintenance and operational history of any location; and,
- A review of any available documentation regarding works undertaken at the site where asbestos may have been identified.

Paragraph 4 of the Control of Asbestos Regulations (Northern Ireland) 2012 requires the ‘duty holder’ of a property to maintain a record of the locations where asbestos is or has been present, and its condition. Typically, the findings of this assessment should be recorded in an ‘asbestos register’ or file that is retained and maintained. As part of the desktop study, especially when buildings are present on site, the asbestos register should be requested and inspected. If this is not available, a survey should be carried out by a Competent Practitioner and their findings used to inform the design of any investigation that is to be undertaken.

The table below outlines current guidance and good practice relevant to preliminary and non-intrusive methods for assessing the potential for AiS to be present.

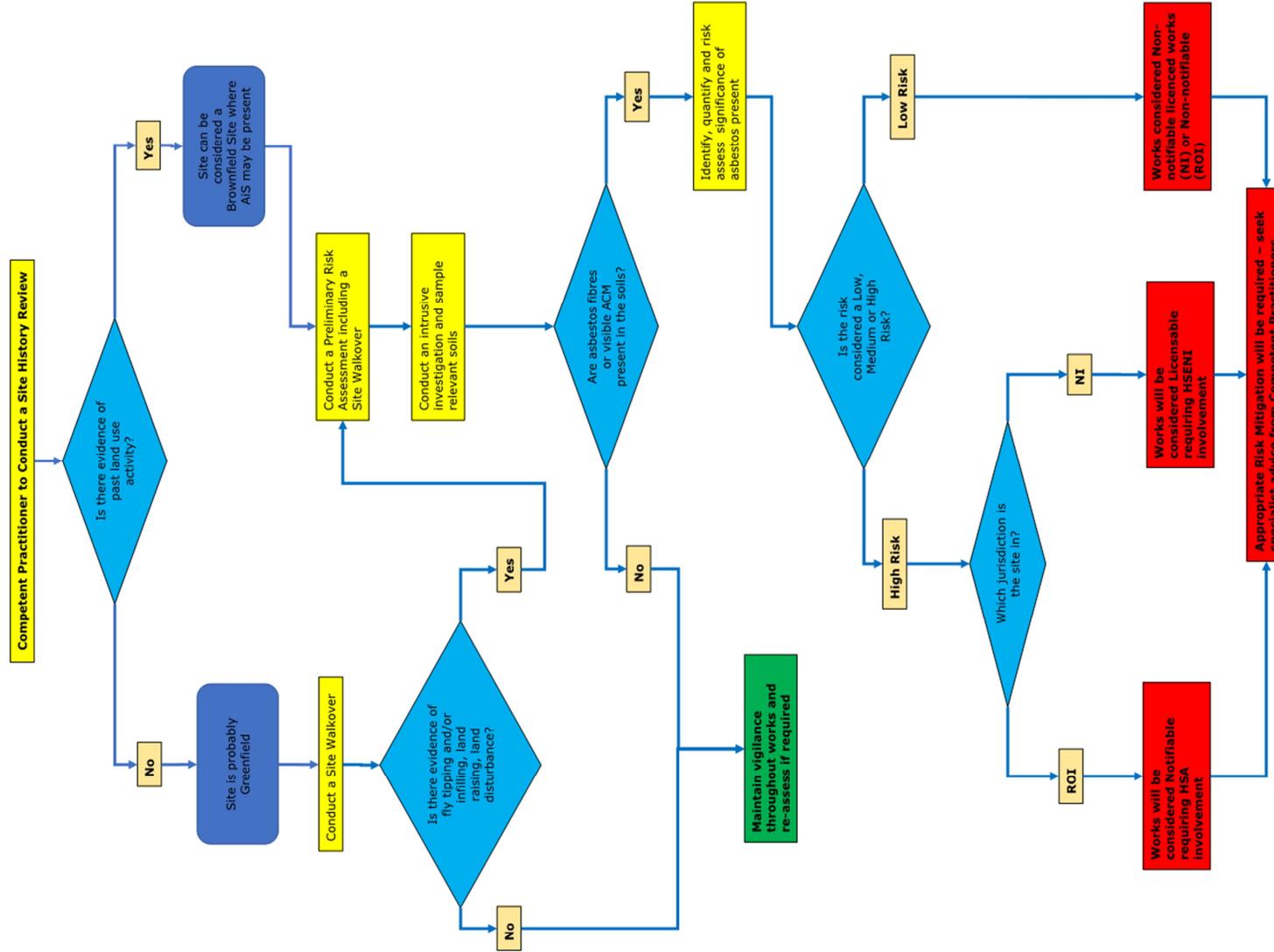
ROI	NI	Guidance Document Title	Summary of Relevance to AiS
C	X	Department of Environment (1995) Industry Profiles	Provides information on the processes, materials and wastes associated with various industrial activities. Asbestos is listed as a potential contaminant in every industry profile. A specific profile document is provided for asbestos manufacturing works.
	X	Department of the Environment Transport and Regions (1994) <i>CLR Report No. 2 – Guidance on</i>	Provides practitioners with advice as to how to conduct the initial stages of a risk determination (Preliminary Risk Assessment) that includes site walkovers, desktop study reviews, information searches, map reviews, etc.

ROI	NI	Guidance Document Title	Summary of Relevance to AiS
		<i>Preliminary Site Inspection of Contaminated Land</i>	
C	X	Environment Agency (2004) <i>Contaminated Land Report 11 – Model Procedures for the Management of Land Contamination</i>	Although withdrawn by the authors (England’s Environment Agency), this still provides an NI-relevant technical framework for applying a tiered risk management approach when dealing with land affected by contamination.
X		Environmental Protection Agency (2007) <i>Code of Practice Environmental Risk Assessment for Unregulated Waste Disposal Sites</i> .	Provides guidance on completing environmental risk assessments of unregulated waste disposal sites which have been identified through the application of the Agency’s Site Identification Methodology. It sets out a framework to allow the intrinsic risk posed by the activity to the environment to be assessed. The intrinsic risk relates to the risk posed without any mitigation measures having been put in place to reduce that risk. The CoP follows international good practice and is primarily aimed at providing guidance for historic unregulated and illegal waste disposal sites. Although this document does not account for potential risks to Human Health, such risks can be introduced within this assessment.
C	X	Research and Development Document 66 (2008) – <i>Guidance for the Safe Development of Housing on Land Affected by Contamination</i>	In alignment with CLR 11, this guidance outlines a phased process for identifying and assessing hazards, estimating and evaluating associated risk, and then designing, implementing and verifying remediation of those hazards. Where applicable, this will include the management of AiS.
X		Environmental Protection Agency (2013) <i>Guidance on The Management of Contaminated Land and Groundwater At EPA Licensed Sites</i>	This document sets out the EPA’s position in relation to its risk-based approach to the management of contaminated land and groundwater at EPA licensed sites. While it is only relevant to a licensed site, it is often referred to by practitioners as it represents a regulator-approved framework to follow.

ROI	NI	Guidance Document Title	Summary of Relevance to AiS
C	X	SOBRA April 2015 – <i>Conceptual Framework for Asbestos Risk Assessment & Control</i>	Presents an AiS-specific framework for the assessment of the significance of risk posed by AiS and identifies primary and secondary actions required prior to moving onto site investigations and risk assessments.
C	X	CL:AIRE February 2017 – <i>Decision Support Tool for the Qualitative Risk Ranking of Work Activities and Receptors Involved in or Exposed to Asbestos in Soil and Construction & Demolition Materials</i>	Assists the user in the ranking of risk relevant to activities and receptors as part of the Preliminary Risk Assessment procedure as described under Environment Agency’s Land Contamination: Risk Management
C	X	CIRIA C765 (2017) – <i>Asbestos in soils and Made Ground good practice site guide</i>	Outlines that a risk assessment should be carried out where there is a strong likelihood of ACS ³ being present on a site through background checks arising from a desk study.
C	C	Environment Agency (2019) Land Contamination: Risk Management	Produced for England and Wales regulatory bodies and replaces CLR11 in those jurisdictions but contains relevant and easily accessible web-based information and suitable approaches to a risk-based assessment of AiS that may also be relevant to sites in Ireland.

³ ACS = asbestos contaminated soils

Flow Chart 1: Determining Whether AIS Maybe Present and Relevant Licence Requirements.



4.2 Ground Investigation and Sampling

Should the preliminary assessment identify the potential for AiS to be present in soils, the practitioner may then need to progress to confirming, and where present, quantifying that presence through intrusive site investigations.

Where an intrusive investigation is to be undertaken, there are legal responsibilities on the following:

- The employer of any site staff to undertake appropriate risk assessments regarding the potential for exposure to asbestos.
- The employer of any site staff to provide adequate training regarding the identification of asbestos (e.g. asbestos awareness training).
- The Principal Designer and Designer of any site investigation to plan, manage, monitor and co-ordinate health and safety before and during the works.

Following the desktop study, it will be possible to determine if the proposed work (including preparatory work) requires the HSA to be notified (ROI) or is licensable by the NI Health and Safety Executive (HSENI). Guidance on assessing if a project includes Notifiable work (only ROI) is presented in the 2013 HSA guidance document. For NI, assessing whether work is licensable work (LW) or non-licensable work (NLW) guidance is provided in the CIRIA C765; the CL:AIRE CAR-SOIL (2016) guidance document; and CL:AIRE's *Decision Support Tool for the Qualitative Risk Ranking of Work Activities and Receptors Involved in or Exposed to Asbestos in Soil and Construction & Demolition Materials*. This is discussed further in Chapter 5.

Should the work be Notifiable (ROI) or LW (NI) then it will be necessary to procure a specialist (ROI) or a suitably licensed contractor (NI) to carry out the work. In both the ROI and NI if exposure is "low and sporadic" the work is unlikely to be Notifiable (ROI) or Licensable (NI). Within NI, even if work is NLW it could be Notifiable. The Non-Notifiable LW is reserved for very low risk activities and further guidance should be sought to determine if NLW is notifiable or not.

The designer of the ground investigation (GI) should consider the likelihood of encountering asbestos in each stratum. Drilling methods should be selected that prevent generation of dust from layers which could contain asbestos e.g. rotary drilling using an air flush should be avoided in Made Ground and rock

with naturally occurring asbestos minerals. Where there is a risk that spoil could contain AiS, mitigation should also be put in place to manage the risk by for example dampening the spoil or covering it to prevent it from drying out.

Regardless of the perceived risk of encountering AiS during a GI, suitable documented contingency plans must be in place prior to a GI commencing. All site personnel conducting GIs must, as a minimum, be Asbestos Awareness trained. Guidance is provided in the Association of Geotechnical and Geo-environmental Specialists Report⁴ for a ‘dynamic risk assessment’ which can be carried out if potential ACMs are discovered during a GI. Similarly, ‘Key actions if suspected asbestos is discovered’ are listed in the CIRIA C765 guidance.

Whether AiS is the primary contaminant of concern for a GI, or if it is included within a wide suite of potential contaminants, it is technically challenging to investigate. In soil, it is often buried within the matrix and mixed with other materials and is observed either as fragment asbestos and/or as fibres, both of which occurrences require training to identify. If only fibres are present, detection is only be possible in a laboratory. However, the volume of asbestos often only accounts for a relatively small volume of the total volume of soil. Hence, the probability of encountering AiS during a GI can be low even on a site where contamination is present. Consequently, investigations should not be considered definitive, and assessments should be very cautious about drawing conclusions about the total absence of AiS on a site.

Considerable guidance is provided on carrying out ground investigations on potentially contaminated soil⁵ which covers many aspects of ground investigations not covered in this chapter. The following text supplements this guidance.

⁴ Association of Geotechnical and Geo-environmental Specialists, 2013. Site Investigation Asbestos Risk Assessment for the protection of site investigation and geotechnical laboratory personnel

⁵ British Standard, 10175 – Investigation of Contaminated site – Code of Practice

4.2.1 Intrusive method

Site and ground investigations are undertaken for many reasons, and the design and implementation of any investigation will be subject to its overall aims and objectives that often extend beyond solely asbestos in soils. However, in designing the method of investigation, the probability of seeing ACMs in the soil is increased when a larger surface area is available. SOBRA soil sampling protocol for AiS⁶ from the surface recommends an area of 0.5m² (0.7m x 0.7m) when sampling. This is significantly larger than the surface area of a borehole. Hence, when there is a need to investigate asbestos at depth, ideally methods should be used that provide a large surface area for investigation such as trial pitting. While borehole drilling can still be appropriate, the smaller surface area of the diameter of the drill makes the method less likely to encounter AiS, and this should be reflected in the sampling regime and later interpretation of the results. Trial pitting allows a greater surface area to be observed which increases the chance of observing ACMs and allows logging to be more robust.

4.2.2 Logging

In addition to sampling, rigorous logging of the soil in accordance with good practice⁷ is essential. The identifying of asbestos in soils, whether as ACMs or fibre bundles, is challenging, and often where free fibres are present, they will not be visible to the naked eye. Therefore, and further to section 4.2, the providing of appropriate training and experience to staff involved in groundworks and investigations in identifying where asbestos in soils is or may be present is imperative. Often, decisions are made in relation to the remediation of a site based on the presence of the ACMs. Logs must reflect what is observed and, if possible, in which layers of Made Ground that ACMs were seen. If multiple layers of Made Ground are present e.g. crushed fill from the 1970s over silts placed during the 19th century, then these should be distinguished. Often, one has a lower potential of asbestos contamination.

⁶ Society of Brownfield Risk Assessment, 2015. Soil Sampling Protocol for Asbestos in Soil

⁷ BS5930:2015- Code of Practice for Site Investigations

4.2.3 Sampling frequency

Considering the challenging nature of investigating AiS, it is recommended that the GI method should include a high frequency of sampling. This is reflected in Appendix D of WM3⁸ and the Western Australia guidance document⁹ that presents a matrix for intrusive locations dependent on the probability of encountering AiS highlighted during the desktop study. This suggests that, for sites that are likely or known to have AiS, the sampling frequency (as specified in the guidance document) should be doubled.

The table below outlines current legislation, guidance and good practice relevant to undertaking site investigations.

ROI	NI	Guidance Document Title	Summary of Relevance to AiS
C	C	Western Australian Department of Health, (2009) Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia	Guidance document expressly relevant to the legislation and the hot and sparsely populated environment of Western Australia. However, as the risks presented by asbestos fibres are the same across all jurisdictions, the technical guidance in relation to the aspects of investigating asbestos are useful. The IBN is aware that this document is currently being reviewed by Australian practitioners and regulators.
C	X	Health and Safety Executive HSG 264 (2012) Asbestos: The Survey Guide	Whilst primarily relevant to asbestos in built structures, Chapter 4 of this document outlines the elements of a survey specifically relevant to addressing issues with asbestos, which in turn can be applied to AiS, such as the need to prevent the disturbance and spread of ACMs where possible and practicable.
C	X	Association of Geotechnical and Geo-environmental Specialists (2013). <i>Site</i>	Guidance issued to AGS members to raise awareness of GI contractors' responsibilities relating to AiS and ACMs encountered during intrusive site investigations.

⁸ Environment Agency, (2018). Technical Guidance WM3: Guidance on the classification and assessment of waste (1st Edition v1.1)

⁹ Environmental Health Directorate (2009) Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia

ROI	NI	Guidance Document Title	Summary of Relevance to AiS
		<i>Investigation Asbestos Risk Assessment for the protection of site investigation and geotechnical laboratory personnel</i>	
C	X	British Standard 5930:2015 <i>Code of practice for ground investigations</i>	Deals with the investigation of sites in order to assess their suitability for construction and to identify the characteristics of a site that affect the design and construction of the project. Relevant to AiS, this will include its nature, distribution and future management through the construction process.
C	X	SOBRA April 2015 – <i>Soil Sampling Protocol for Asbestos in Soil</i>	Documents good practice for the safe collection of representative soils samples.
C	C	SOBRA April 2015 – <i>Design of an Activity-Based Sampling Protocol for the Testing of Asbestos Fibre Release Potential from Residential Garden Soil</i>	Although written for a legal regime irrelevant to Ireland, this paper does provide good practice guidance on the testing of the asbestos fibre release potential from a residential garden where AiS may represent a potential risk to human health.
C	X	British Standard 10175:2017 <i>Investigation of potentially contaminated sites. Code of practice.</i>	Provides standards to which an investigation should be completed, detailing the requirement to set clear objectives and using defined strategies and how and where representative soils samples should be collected.
C	X	CIRIA C765 2017 – <i>Asbestos in Soil and Made Ground Good Practice Site Guide</i>	Provides advice to all workers who may come into contact with or are required to manage soils and Made Ground that have the potential to contain asbestos and provides a framework to help minimise the potential health risks and associated liabilities. As outlined above, this will be relevant to all brownfield sites where AiS may be present.

4.3 Laboratory Analysis

Where AiS is suspected, soil samples are collected to quantify the potential risk. Laboratory analysis is undertaken to identify the type and nature of the material and its condition. Depending on the laboratory and the analysis method employed, the following information can be reported:

- Asbestos type;
- Presence bound in ACMs, as free fibres or in fibre bundles;
- Asbestos quantity by percentage weight to weight (%w/w) of the sample; and
- ACMs condition, whether that be degraded or not.

An overview of the guidance and accreditations applicable to laboratories and analysts is presented below.

ROI	NI	Guidance Document or Accreditation OR Scheme Title	Summary of Relevance to AiS
C	X	UK Health and Safety Executive's Guidance HSG 248: The analysts guide for sampling, analysis and clearance procedures	This is a guidance document which applies to the ROI and NI, and which provides laboratory details on quality assurance, training for analysts, bulk sampling and analysis, air sampling and analysis, enclosures, site certification for reoccupation, supervisory work, personal protective equipment, and decontamination procedures. The successful application of this guidance document is assessed when ISO accreditation is being determined. The analytical method involves initial examination by eye of suspect material by a competent analyst under a low power stereo microscope. Fibres are then positively identified using Polarised Light Microscopy (PLM).
X		HSA, 2013, <i>ACM in Workplaces; Practical Guidelines on ACM Management and Abatement</i>	This HSA document requires analysis of bulk samples to be carried out in accordance with HSG 248 and that analysts should have in-house documented procedures which conform to a recognised quality assurance system such as the international standard ISO 17025: General requirements for the competence of testing and calibration laboratories; the Analyst/laboratory should perform

ROI	NI	Guidance Document or Accreditation OR Scheme Title	Summary of Relevance to AiS
			satisfactorily in a scheme such as the AIMs scheme or Regular Inter-laboratory Counting Exchange (RICE) schemes.
C	X	Standing Committee of Analysts (2017) The Quantification of Asbestos in Soil. Methods for the Examination of Waters and Associated Materials.	This document provides a method for the quantification of the mass of asbestos in soil, construction materials/products and/or associated materials through the following methods: <ul style="list-style-type: none"> • Gravimetric method for ACMs and fibre bundles. • Phase contrast microscopy (PCM) for dispersion and fibre counting, including calculations of the construction of total fibres and potentially respirable fibres as appropriate.
X	X	ISO/IEC 17025 Testing and Calibration Laboratories	This is an accreditation scheme which enables laboratories to demonstrate that they operate competently and generate valid results. The United Kingdom Accreditation Service (UKAS) is currently the sole recognised accreditation body in the UK. INAB is the accreditation service in the ROI.
X	X	BOHS, September 2018, P401 Proficiency qualification; identification of asbestos in bulk samples	This course provides analysts with a theoretical and practical qualification in the techniques of asbestos sample identification using polarised light microscopy (PLM) and dispersion staining techniques. This certification applies to asbestos bulk and laboratory analysts. The requirement to be formally trained is set out in HSG 248.
X	X	BOHS, October 2018, P403 Proficiency qualification; Asbestos Fibre Counting (PCM)	This course provides analysts with theoretical and practical knowledge in the techniques of fibre counting of asbestos air samples using a Phase contract Microscopy. The requirement to be formally trained is set out in HSG 248.
X	X	BOHS, July 2018, P408 Advanced Proficiency Qualification Identification and Quantification of Asbestos in Soils using PLM and PCM	This course provides a qualification in safely identifying and quantifying asbestos in soil to a standard consistent with the HSL Asbestos in Soil Scheme (AISS). Analyst must hold a qualification in P401 in order to complete this course.

ROI	NI	Guidance Document or Accreditation OR Scheme Title	Summary of Relevance to AiS
X	X	Asbestos in Materials Scheme (AIMS)	<p>This scheme assesses the performance of laboratories carrying out the identification of asbestos in bulk materials.</p> <p>UK laboratories are required to be accredited by the UKAS to ISO 17025 to undertake analysis as part of assessing whether materials contain asbestos under the Control of Asbestos Regulations (CAR). Participation in AIMS in the United Kingdom is recommended in the Health and Safety Executive's Guidance - HSG 248, "Asbestos: The analyst's guide for sampling, analysis and clearance procedures" Participation in the scheme is also open to non-UK laboratories.</p> <p>In ROI, laboratories accredited to ISO 17025 by the Irish National Accreditation Board (INAB) and which undertake analysis of materials suspected of containing asbestos are required to participate in AIMS. Non-INAB accredited ROI laboratories undertaking materials analysis are required by the Irish Health and Safety Authority (HSA) to maintain a satisfactory performance in the AIMS scheme. Certified laboratories can be found listed on the AIMS web page.</p>
X	X	Asbestos in Soil Scheme (AISS)	<p>This scheme assesses the performance of laboratories carrying out the identification of asbestos in soils.</p> <p>The purpose of the scheme is to assess the proficiency of laboratories undertaking qualitative and quantitative analysis of asbestos in soils (contaminated land). The scheme is operated by HSE and is open to UK & Non-UK based soils laboratories. There are two options available:</p> <ul style="list-style-type: none"> • AISS Qualitative - identification of asbestos types present • AISS Quantitative - identification and quantification of asbestos types present
	X	<i>Control of Asbestos Regulations 2012</i>	<p>CAR 2012 legislation requires that employers who use laboratories to undertake air sampling and analysis of air samples should assure themselves that the laboratory conforms to the competence standard ISO/IEC 17025. It also requires that employers who engage laboratories to analyse asbestos materials assure themselves that the laboratory also conforms to ISO 17025. Conformation to ISO</p>

ROI	NI	Guidance Document or Accreditation OR Scheme Title	Summary of Relevance to AiS
			17025 is demonstrated by obtaining accreditation from a recognised body. The United Kingdom Accreditation Service (UKAS) is currently the sole recognised accreditation body in Great Britain. The UKAS document which details the accreditation requirements and procedures (UKAS publication LAB 30 Application of ISO/IEC 17025 for asbestos sampling and testing) is published on the internet, and can be downloaded from their website, www.ukas.com .
X	X	Regular Inter-laboratory Counting Exchange (RICE) schemes	This scheme assesses the proficiency of laboratories counting asbestos fibres in air and is operated by HSE Testing and Monitoring which oversees management, registration, and membership matters together with distribution of the samples and processing the participant data.

5 Risk Assessment and Remediation

Risk is defined as the potential consequence(s) of a hazard combined with their likelihoods/possibilities of exposure to that hazard (DEFRA's 2013 document *Green Leaves III – Guidelines for Environmental Risk Assessment and Management*).

Risks associated with AiS can comprise one, or a combination of, the following elements:

- Legal Risks – Where there is risk of prosecution from breaching legislation or negligence;
- Financial Risks – Where a cost or budget arises; or,
- Reputational Risks – Where a party's reputation may be damaged.

The assessment of risks associated with AiS in Ireland can generally be separated into two legal contexts.

- i. Those associated with occupational exposure; and,
- ii. Those relevant to a Planning Application.

However, considering the objectives of this document, risks associated with AiS are generally considered to be related to persons involved in investigation and assessment, and risks associated with long-term exposure when occupying sites where AiS may be present. There is significant cross-relevance with each element, and the definition and assessment of risk is, therefore, largely dictated by the legal context.

Remediation is defined as the action taken to prevent or minimise, remedy or mitigate unacceptable levels of risk. Remediation can be undertaken where unacceptable risks have been identified through investigation and assessment.

Further to the indicative scenarios outlined in Chapter 5.1, the nature and extent of any remediation will be determined by the level of risk posed and the context of the assessment being undertaken.

Other liabilities associated with AiS include civil actions and insurable actions associated with employer’s liability and professional indemnity cover for which there is no clear guidance available. Consequently, these elements have been largely omitted from this document

5.1 Risk Assessment

Where asbestos has been identified in soil, the level of risk posed should be assessed relevant to the context of the assessment being undertaken, for example, where investigation, sampling and analysis have been undertaken for the following scenarios:

- A contaminated land risk assessment for development, the level of risk posed to existing and future site users will be assessed;
- Where enforcement action is being taken by a Local Authority and/or Regulator; and
- When a property transaction is being undertaken, the vendor and purchaser may wish to understand the level of legal and financial risk associated with either disposing of or acquiring any asset.

As outlined above, the type and level of risk depends on the nature of the assessment being undertaken. In this regard, guidance documents relevant to assessing risks associated with AiS is outlined below.

ROI	NI	Guidance Document Title	Summary of Relevance to AiS
C	X	Environment Agency (2004) <i>Contaminated Land Report 11 – Model Procedures for the Management of Land Contamination</i>	Now withdrawn by the Environment Agency for England, this document provides a technical framework for applying a tiered risk management approach when dealing with land affected by contamination, including where AiS is potentially present or is confirmed to be present.
C	X	AGS (2013) Site Investigation Asbestos Risk Assessment for the protection of site investigation and geotechnical laboratory personnel	Provides an outline for the assessment of risk for those who may be involved directly or indirectly with the AiS site investigation process to support the discharging of duties relevant to occupational health and safety legislation.

ROI	NI	Guidance Document Title	Summary of Relevance to AiS
C	X	CIRIA (2014) Asbestos in soil and Made Ground: a guide to understanding and managing risks. Ready reference (SP168)	A ready reference guide to be used in conjunction with the CIRIA 733 document, the objective of which is to provide a digest of contemporary information and guidance with the aim of raising current good practice relevant to the topic.
C	X	CIRIA (2014) Asbestos in soil and Made Ground: a guide to understanding and managing risks (C733).	This document recommends a 'lines of evidence' approach where more than one method is used to estimate the concentrations of airborne fibres that are likely to be generated from AiS on sites. It also outlines that, except for low-risk sites, measuring soil concentrations alone is unlikely to be sufficient to estimate the level of risk posed. This document also outlines that thresholds used in other asbestos-related assessments (such as laboratory detection limits or for hazardous waste thresholds) should not be used for the assessment of AiS risk.
C	X	SoBRA (2015) Conceptual Framework for Asbestos Risk Assessment & Control	Provides a common and scalable framework for assessing and managing risks associated with asbestos for activities that may take place before, during and post-development. The process is broken into a number of discrete steps to assist the user in developing a conceptual model and understanding the uncertainties of a site and the activities taking place.
C	X	CAR-SOIL (2016) Control of Asbestos Regulations 2012, Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials. Industry Guidance.	Chapter 6 of this document interprets the relevant section of the legislation relating to the assessment of work that exposes employees to asbestos from soils. This includes general requirements for the assessment of risk and outlines that employers should make sure that those carrying out any risk assessment should be competent to do so.
C	X	CIRIA C765 2017 – <i>Asbestos in Soil and Made Ground Good Practice Site Guide</i>	Provides advice to all workers who may come into contact with or are required to manage soils and Made Ground that have the potential to contain asbestos and provides a framework to help minimise the potential health risks and associated liabilities.

ROI	NI	Guidance Document Title	Summary of Relevance to AiS
C	X	Environment Agency (2019) – Land Contamination: Risk Management	The replacement to CLR11 and provides an updated framework for the appropriate risk-based management of AiS.
	X	Department of Agriculture, Environmental and Rural Affairs (2019) Environmental Advice for Planning, Practice Guide, Redeveloping Land Affected by Contamination	An NIEA-produced developer’s guide for the production of suitably robust supporting information for brownfield sites being progressed through the Planning process in Northern Ireland.

5.2 Remediation

Remediation methods can generally be defined as being one of three types:

- Engineered – By removal or creating a physical barrier between the AiS and the potential receptor;
- Institution Control – Through amending the land use type to one with a lower sensitivity; and
- Chemical Treatment – Rarely used when dealing with AiS; involves the use of chemicals to stabilise or destroy asbestos in the soil matrix.

The use of multiple techniques is common where a more sustainable approach to remediation is required.

The table below outlines the guidance documents relevant to the remediation of AiS.

ROI	NI	Guidance Document Title	Summary of Relevance to AiS
C	X	CIRIA (2014) Asbestos in soil and Made Ground: a guide to understanding and managing risks (C733).	Chapter 15 of this document provides a summary of current and emerging approaches to the management and remediation of AiS, including engineering methods such as source removal (hand picking), cover systems and relocation on site, and emerging chemical techniques such as

ROI	NI	Guidance Document Title	Summary of Relevance to AiS
			acid reduction. It also highlights the need to verify that remediation has been carried out as required and to standards set by the relevant authorities.
C	X	CIRIA (2014) Asbestos in soil and Made Ground: a guide to understanding and managing risks. Ready reference (SP168)	This document is a ready reference guide for the CIRIA C733 document and outlines that in certain scenarios, site investigations and remediation can be defined as licenced work (LW) or non-licenced work (NLW) under CAR 2012. This document also provides a short summary of remedial techniques and scenarios where AiS can be left in situ. In addition, mechanisms for transferring legal and financial liabilities, such as insurance products, are provided.
C	X	CIRIA (2017) Asbestos in soil and Made Ground good practice site guide (C765)	This document was produced as a good practice site guide for those involved in investigating, assessing and remediating AiS, and highlights the need for an appropriate and documented remedial strategy. This document also provides a summary of legal requirements for control measures where remediation is being undertaken.
C	X	CAR-SOIL (2016) Control of Asbestos Regulations 2012, Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials. Industry Guidance.	Produced to interpret the application of CAR 2012 to AiS, this document provides examples of scenarios that would be considered licenced work (LW), non-notifiable licenced work (NNLW) or non-licenced work (NLW). This document also provides and interpretation of the application of the following regulations: <ul style="list-style-type: none"> ▪ Regulation 10 regarding information, instruction competency and training; ▪ Regulation 11 regarding the prevention or reduction of exposure to asbestos during remedial works; ▪ Regulation 15 regarding arrangements to deal with accidents, incidents and emergencies during remedial works; and ▪ Regulation 17 regarding cleanliness of premises and plant.
C	X	RemSoc (2019) A Practitioners Framework for Remediation (v1.01)	Provides a framework to guide practitioners through the key states of a remediation project and to sign post factors and decisions that may be required at each project stage,

5.3 Verification and Validation

Where remediation has been undertaken, there is often a need to demonstrate that the remedial objectives have been achieved and that the works have been undertaken to the specification and standard required to mitigate the associated risks. This can be done through a combination of the following:

- Verification – Confirmation that something has been done through the providing of objective evidence (e.g. photographs and/or documents); and/or,
- Validation – Confirmation that an objective or target has been achieved by providing objective evidence (e.g. sampling and analysis).

Depending on the nature and context of the assessment and the regulatory regime under which the works are being undertaken, one or both approaches will be required.

The table below provides a summary of guidance and good practice documents relevant to both validation and verification of remediation of AiS.

ROI	NI	Guidance Document Title	Summary of Relevance to AiS
C	X	Environment Agency (2004) <i>Contaminated Land Report 11 – Model Procedures for the Management of Land Contamination</i>	A now withdrawn document but one that defines verification as part of the implementation of any remedial strategy and as an integral part of the technical framework.
C	X	Environment Agency Report SC030114/R1 - Verification of Remediation of Contaminated Land (2010)	Defines verification as an integral component to ensure that the remedial objectives are defined, and that appropriate evidence is collected and assessed to demonstrate how they have been met. This document outlines the verification process and provides a technical framework from implementation, to monitoring and completion.
C	X	Liverpool City Council (2010) Verification Requirements for the Remediation of Contaminated Land Cover Systems.	Produced to supplement existing guidance on the verification of remediation, including CLR 11 and the Environment Agency’s Verification of Remediation of Contaminated Land (2010). It provides definitions of both verification and validation, and also the process of verification from

ROI	NI	Guidance Document Title	Summary of Relevance to AiS
			implementation planning through to completion. Examples of good practice, including the collation of photographic and documentary evidence are provided.
C	X	CIRIA (2014) Asbestos in soil and Made Ground: a guide to understanding and managing risks. Ready reference (SP168)	Outlines that careful verification is critical in maintaining public confidence in the remedial process.
C	X	CAR-SOIL (2016) Control of Asbestos Regulations 2012, Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials. Industry Guidance.	Outlines that under regulation 17 (regarding cleanliness of premises and plant), independent certification or validation is required to demonstrate that the work has been completed satisfactorily.
C	X	CIRIA (2017) Asbestos in soil and Made Ground good practice site guide (C765)	Defines a verification report as something that details the work carried out, and as something that is often required as part of the planning process to demonstrate that the works done were in accordance with the agreed remediation plans. It also outlines that verification is a good practice control measure for all facets of asbestos related work, whether LW, NLW or NNLW.
C	X	Environment Agency (2019) – Land Contamination: Risk Management	The replacement to CLR11 and provides an updated framework for the appropriate risk-based management of AiS.

6 Waste Classification and Disposal

6.1 Waste Management Policy

Disposal of asbestos and AiS must be managed in compliance with Waste Legislation which is extensive and often complex.

The Waste Framework Directive (Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste) is a principal part of waste regulations across Europe. The Waste Framework Directive encourages the prevention, recycling and processing of waste. It sets out a waste hierarchy which priorities waste prevention, preparation for re-use, recycling and energy recovery. In ROI, the primary platform for waste legislation is the Waste Management Act 1996 and the Protection of the Environment Act 2003. These Acts have been further amended by enacting regulations, mainly the Waste Directive Regulations, that address new EU environmental initiatives and strengthen areas where problems have arisen. The Waste and Contaminated Land (Northern Ireland) Order 1997), was introduced in Northern Ireland as a result of the Waste Framework Directive (75/442/EC) (as amended by 91/156/EEC and 91/692/EEC), The Hazardous Waste Directive (91/689/EC) and The Landfill Directive (1999/31/EC) which set legal standards and responsibilities for the deposit, treatment, keeping or disposal of waste.

Waste soils arising from brownfield sites that have or may contain AiS materials must be appropriately characterised and classified to ensure compliance with relevant Waste legislation.

6.2 Waste Classification

Correct assessment and classification of waste soils is a legal obligation and is therefore reliant on the appropriate and compliant sampling and analysis to enable characterisation and classification for disposal. Details on the methods of sampling and laboratory analysis are outlined in Chapter 4 of this document.

Waste classification includes assigning a European Waste Catalogue (EWC) code from the European Economic Community Commission Decision 2000/532/EC (List of Waste Code (LOW)), which is a harmonised coding system for all waste types. Waste can have one of the following three entry types: Non-hazardous; Hazardous; or Mirror (either Hazardous or Non-hazardous based on assessment). Waste soil including AiS is classified under the following mirror entry:

- 17 05 03 soil and stones containing hazardous substances;
- 17 05 04 soil and stones other than those mentioned in 17 05 03; and,
- 17 06 04 Insulation materials other than those mentioned in 17 06 01 and 17 06 03.

Further to the definition of AiS provided in Section 1.1 of this document, waste soils can also comprise entirely anthropogenic materials in the subsurface. Therefore, the following hazardous entries may also apply:

- 17 06 01* Insulation materials containing asbestos;
- 17 06 03* Other insulation materials consisting of or containing hazardous substances; and,
- 17 06 05* Construction materials containing asbestos.

Further assessment is required to legally classify waste soil as either Hazardous or Non-hazardous on the basis of displaying any hazardous properties (HP1 - HP15), and specifically in relation to AiS whether the waste soil exhibits carcinogenic hazard property (HP7) .

Asbestos is identified as Category 1 Carcinogen under Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006.

Soil with an asbestos free fibre concentration of >0.1%w/w will be classified as hazardous due to the soil exhibiting carcinogenic hazard property HP7. Regardless of whether the asbestos free fibre content is <0.1%w/w, if a soil contains visibly identifiable (to the naked eye) fragments of ACMs, the 'mixed waste rule' applies and that soil is considered as contaminated with a hazardous material and is therefore a Hazardous waste.

Classification of a waste soil as either Hazardous or Non-hazardous must be carried out using total pollutant content analytical data for the soil sample whether the concentration of asbestos is <0.1%w/w or not. Leachate data is not suitable for classifying soils as hazardous or otherwise.

Once the waste has been classified as either Hazardous or Non-hazardous, it may be assessed to determine if it meets with the Waste Acceptance Criteria (WAC) for a given landfill type.

- In both jurisdictions, waste that has been classified as ‘hazardous’ cannot be disposed of at an inert or non-hazardous landfill facility regardless of compliance with WAC.
- In Northern Ireland, where the UK approach is adopted, there is currently no numerical WAC limits for non-hazardous landfill as outlined in Environment Agency Guidance ‘Waste acceptance at landfills’ (2010, now withdrawn).
- In the Republic of Ireland, the non-hazardous WAC limits outlined in article 2.2 of the European Council Decision 2003/33/EC are applied.

It should also be noted that regardless of whether the asbestos concentration is <0.1%w/w or not, once a waste soil has been classified as non-hazardous yet exceeds WAC for acceptance at an inert landfill, it cannot be classified as hazardous.

Relevant guidance documentation on waste classification that can be applied to classification of AiS is outlined below.

ROI	NI	Guidance Document Title	Summary of Relevance to AiS
C	X	BSEN14899:2005 Characterisation of Waste. Sampling of Waste	A European Standard for the development of Sampling Plans that suitably characterise waste AiS for disposal.
X		Environmental Protection Agency (2015). List of Waste & Determining if Waste is Hazardous or Non-hazardous. Waste Classification.	Appendix 4 of the document provides a reference list of pertinent European and Irish Standards relevant to sampling of waste for the correct and appropriate characterisation of waste.
X		Environmental Protection Agency (2015). List of Waste & Determining if	Waste Classification - This document sets out the procedure for the classification of waste in accordance with EU legislation, including determining if waste is Hazardous or Non-hazardous, and

ROI	NI	Guidance Document Title	Summary of Relevance to AiS
		Waste is Hazardous or Non-hazardous. Waste Classification.	the complete List of Waste (LoW). There are no specific examples or guidance on asbestos in soil and stone waste. N.B. has not been updated to incorporate (EU) 2017/997 amendment on HP14 assessment. Sampling for Waste Classification - Appendix 4 of the document provides a reference list of pertinent European and Irish Standards relevant to sampling of waste for the correct and appropriate characterisation of waste.
X		Environmental Protection Agency (2015). List of Waste & Determining if Waste is Hazardous or Non-hazardous. Waste Classification.	Appendix 4 of the document provides a reference list of pertinent European and Irish Standards relevant to sampling of waste for the correct and appropriate characterisation of waste.
C	X	Environment Agency, (2018). Technical Guidance WM3: Guidance on the classification and assessment of waste (1st Edition v1.1).	Waste Classification - This document provides guidance on waste classification in accordance with EU legislation. It is a comprehensive reference on the determination of whether a waste is Hazardous or Non-hazardous and includes the full listing of the List of Waste (LoW waste classification codes, also referred to as LoW). 'Chapter 3 Further Guidance on Assessment' provides a worked example of classification and assessment of Construction and Demolition wastes containing asbestos that can be directly applied to assessing soil waste containing asbestos. Updated to incorporate (EU) 2017/997 amendment on HP14 assessment. Sampling and Waste Classification - The document sets out the legal background and highlights the importance of correctly sampling the waste to enable correct classification (Appendix D). Based on legislative requirements, there are 5 key steps set out to determine the most appropriate sampling plan and the factors that need to be considered in developing the sampling plan for waste classification. The document includes a detailed list of relevant British and European standards for sampling for the purposes of waste classification.

ROI	NI	Guidance Document Title	Summary of Relevance to AiS
X	X	European Commission notice on technical guidance on the classification of waste (2018/C 124/01)	This technical note is a comprehensive register of all relevant European legislation pertaining to waste classification and provides technical guidance and clarification of waste classification. Some examples of waste classification and application of LoW are provided. The document identifies that LoW are applicable to waste containing asbestos that do not necessarily mention asbestos in the LoW entry e.g. asbestos in soil (17 05 03 and 17 05 04).

Some important considerations when assessing soil waste containing asbestos are provided overleaf.

Question: Does the waste contain fragments of asbestos containing materials (ACMs) or dispersed asbestos fibres?

Answer: Further to the Environment Agency's technical guidance WM3 on waste classification Chapter 3 (further guidance on assessment), if waste contains pieces of ACMs that can be identified by the naked eye by a competent person, then these pieces must be assessed separately. The waste will be hazardous if the concentrations of asbestos fibres is 0.1%w/w or greater.

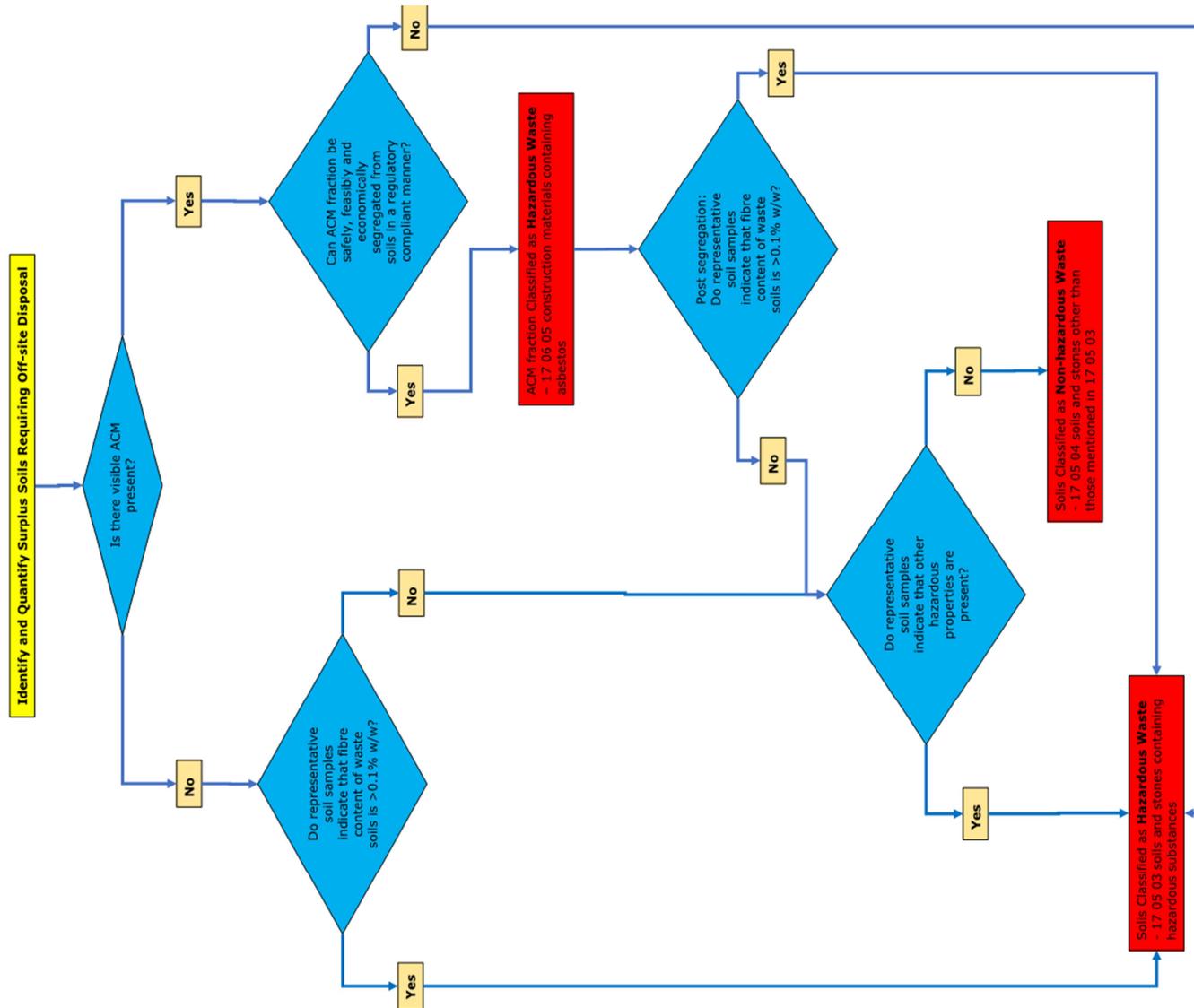
Question: Can Waste Acceptance Criteria (WAC) testing be used to determine if a waste contains asbestos?

Answer: No. WAC testing is only applicable to a landfill's ability to accept a waste and does not classify a waste as being hazardous or not. WAC analysis involves the testing of leachate derived from the waste by a suitably accredited laboratory and does not include analysis for the presence of asbestos. However, some associated tests involve the drying of the waste body that can cause increase the likelihood of asbestos fibres being released where present. As a result, some laboratories will require asbestos identification analysis to be undertaken for health and safety reasons.

Question: Which waste code (EWC) applies to asbestos and contaminated wastes?

Answer: The correct EWC code will depend on the type of waste. Asbestos contaminated soils are typically considered to be soils and stones with applicable codes starting with 17 05. Where the concentration of asbestos exceeds 0.1%w/w, then the code for soils and stones containing hazardous substances is 17 05 03*, an absolute entry. Where asbestos has not been identified by analysis, or the concentration is below 0.1%w/w, then the applicable code is 17 05 04, which is soils and stones other than those mentioned in 17 05 03. Other applicable codes include those for construction materials containing asbestos (17 06 05) or other construction and demolition wastes (17 09 03). As outlined above, where visible ACMs are present, they must be assessed separately and the correct EWC codes applied. Refer to Example 1 in Appendix A of WM3 for guidance on assigning LoW to mixed wastes; and refer to Chapter 3 for guidance on assessment and classification of mixed waste containing asbestos

Flow Chart 2: Waste Assessment and Classification



6.3 AiS Waste Disposal

One of the guiding principles of European waste legislation which has been incorporated into legislation in both NI and ROI is the principle of “Duty of Care”. This requires that the waste producer is responsible for waste from the time it is generated through to its final legal disposal (including its method of disposal) and, thereby, the requirement that a waste is handled, transported and disposed of in a manner that ensures that no adverse environmental impacts occur as a result of any of these activities. Therefore, where the waste producer has employed a waste contractor, it is imperative that appropriately authorised waste contractors are employed to undertake off-site management of any AiS wastes in accordance with all legal requirements to ensure that the transfer to the final destination is lawful.

Asbestos is a hazardous substance; if the soil waste has been classified as Hazardous due to asbestos content, then it must be disposed of as Hazardous waste. There is provision within European legislation (Council Decision 2003/33/EC) for the acceptance of so-called Stable Non-Reactive Hazardous Waste (SNRHW) in a Non-hazardous landfill and this includes asbestos. However, there are specific restrictions on how the asbestos waste must be managed and landfilled, taking account of the specific health and safety requirements for handling asbestos. Similarly, there are restrictions on the handling and transport of asbestos waste and, in particular, AiS with asbestos fibre contamination that must be evaluated using a risk-based approach.

There are disposal options for landfilling of AiS within NI; however, in ROI these options are very limited. At present, there is no licensed disposal facility for AiS in ROI and the only facilities licensed to accept AiS and other asbestos waste are Waste Transfer Stations accepting AiS waste for onwards transfer in accordance with Transfrontier Shipment Regulations to either NI or mainland Europe.

Relevant guidance documentation on the management and disposal of AiS is summarised below.

ROI	NI	Guidance Document Title	Summary of Relevance to AiS
X		EPA Technical Guidance. The Landfilling of Asbestos Waste (December 2006)	Discussion document in relation to the classification of landfills accepting asbestos as a SNRHW (stable non-reactive hazardous waste).

ROI	NI	Guidance Document Title	Summary of Relevance to AiS
C	C	Institute of Occupational Medicine (2006). Historical Research Report TM/88/14 1988 The release of dispersed asbestos fibres from soils Addison J, Davies LST, Robertson A, Willey RJ.	This research paper is often cited for criteria for the management and transport of AiS for the bulk transport of soil contaminated with asbestos fibres. The document presents the research findings on the influence of soil type, asbestos fibre type and concentration, and moisture on the potential release of fibres from soil
X		Environmental Protection Agency (2010). Focus on Landfilling in Ireland	Provides a general overview of the landfilling status in Ireland at the time, and highlights that at that time 'There is currently no Non-hazardous landfill in Ireland with a separate cell for asbestos waste. Nor is there a general Hazardous waste landfill.'
X		EPA Technical Guidance. The Landfilling of Asbestos Waste (December 2006)	Discussion document in relation to the classification of landfills accepting asbestos as a SNRHW (Stable Non-Reactive Hazardous Waste) and position in relation to acceptance of asbestos at landfills in ROI.
	X	A Guide to Consigning Hazardous Waste (DAERA. 2019)	Provides a detailed guide to consignment of waste within NI and between NI and GB including details on how to complete the requisite documentation. Cross-border consignment of waste between NI and ROI is not covered.

7 Conclusion

The assessment and management of AiS can be a project-jeopardising financial burden. The long legacy latent periods and the myriad of legislation governing asbestos represent a potential liability exposure issue for landowners, developers and contractors at every stage of the development cycle and, in some cases, even after a development has been completed and divested. The appropriate management of AiS is therefore critical if Brownfield sites are to be sustainably and appropriately redeveloped throughout the island of Ireland.

This document presents those key pieces of legislation and industry good practice guidance documents that allow all practitioners to adopt appropriate approaches that will generate suitable-for-use redevelopments. By referencing its content, practitioners will be able to identify key sources of information that are appropriate to a site, regardless of its current state within the development cycle and its jurisdiction location.

Abbreviations, Acronyms and Definitions

	Meaning
ACMs	Asbestos Containing Materials – any manufactured product that contains asbestos fibres.
AiS	Asbestos in Soils – asbestos containing materials and or asbestos fibres contained within a soil matrix
C	Denotes a document that could have relevance to both jurisdictions (ROI or NI) and, in the absence of anything else specifically relevant to the jurisdiction, it could be argued that the document represents industry good practice.
C&D	Construction and Demolition Wastes – unwanted waste materials derived from construction and demolition activities
C733	CIRIA’s 2014 document titled <i>Asbestos in soil and Made Ground: a guide to understanding and managing risks</i>
C765	CIRIA’s 2017 document titled <i>Asbestos in Soil and Made Ground Good Practice Site Guide</i>
CAR	Control of Asbestos Regulations (Northern Ireland) 2012 – a Northern Ireland specific legislation that requires employers and clients to prevent or minimise exposure to AiS for workers and for the public close to development sites.
CIRIA	Construction Industry Research and Information Association – a UK-based neutral, independent and not-for-profit body that facilitates improvements throughout the construction industry
CL:AIRE	Contaminated Land: Applications in the Real Environment – a UK-based independent not-for-profit organisation established in 1999 to stimulate the regeneration of contaminated land in the UK by raising awareness of, and confidence in, practical and sustainable remediation technologies.
CLR11	The now withdrawn but archived for referenced, Contaminated Land Report 11 – the Environment Agency for England and Wales’ 2004 guidance document titled <i>Contaminated Land Report 11 – Model Procedures for the Management of Land Contamination</i>
Competent Practitioner	An individual who has a recognised relevant qualification, has sufficient demonstrable experience in assessing and managing the risks presented by AiS, and is preferably a Chartered member of a relevant professional organisation
GI	Ground Investigation – intrusive soil sampling facilitated by trial pits and/or boreholes

	Meaning
HSA	Health and Safety Authority – regulatory health and safety body in Republic of Ireland
HSENI	Health and Safety Executive Northern Ireland – regulatory health and safety body in Northern Ireland
HSG 248	The HSE’s 2005 analysts' guide for sampling, analysis and clearance procedures of asbestos
IBN	Ireland Brownfield Network – an Ireland-based independent network established in February 2012 by a collective of leading brownfield practitioners operating in various professions throughout Ireland. The Network aims to encourage constructive dialogue and interaction amongst all those involved in the redevelopment of brownfield land in the island of Ireland.
JIWG	Joint Industry Working Group Asbestos in Soil and Construction & Demolition (C&D) Materials – a CL:AIRE initiative to produce the guidance titled “Control of Asbestos Regulations 2012: Interpretation for Managing and Working with Asbestos in Soil and Construction & Demolition materials: Industry Guidance”.
LCRM	The Environment Agency’s 2019 replacement to CLR11 and titled Land Contamination Risk Management.
LOW	List of Waste Code
LW	Licensed work – Considered to be works where worker exposure to asbestos is not sporadic and of low intensity; or, where the risk assessment cannot demonstrate that the control limit will not exceed 0.1-fibres per cubic metre of air (f/cm^3). Licensed work also includes that involving asbestos coating or asbestos insulation and/or asbestos insulation board (AIB) where the risk assessment demonstrates that the work is not short duration (>2-hours in any 7-day period where no one person works for more than 1-hour in that 2-hour period).
NI	Northern Ireland
NLW	Non-licensable work – Considered to be short in duration and where the control limit ($0.1-f/cm^3$) will not be exceeded.
NNLW	Notifiable Non-Licensed Work – Considered to be where the risk of the control limit ($0.1-f/cm^3$) being exceeded is low, but still possible. An example involves damaged asbestos cement products.

	Meaning
PLM	Polarised Light Microscopy – a compound microscope equipped with a rotating stage and Polaroid filters for illumination of a sample with polarized light.
ROI	Republic of Ireland
SNRHW	Stable Non-reactive Hazardous Waste
SOBRA	Society of Brownfield Risk Assessment – a UK-based society established in 2009 to support the professionals working in land contamination risk assessment. Its goals are to improve technical knowledge in risk-based decision-making related to land contamination applications and to enhance the professional status and profile of practitioners.
UKAS	United Kingdom Accreditation Service- the UK’s National Accreditation Body, responsible for determining, in the public interest, the technical competence and integrity of organisations such as those offering testing, calibration and certification services.
WAC	Waste Acceptance Criteria – WM3 quote.
WM3	The Environment Agency’s 2018 document titled <i>Technical Guidance WM3: Guidance on the classification and assessment of waste (1st Edition v1.1)</i> .
X	Demonstrates that a document or legislation presented within this document relates specifically to a particular jurisdiction (ROI or NI)