



Development of Land Affected by Contamination

Technical Guidance for Developers, Landowners, Homeowners and Consultants



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Contents Page

Introduction
Planning4
The Developer's Responsibility4
Types of Planning Applications5
Completing the "Existing Use" Section of the planning application form5
What to Submit to Support Your Planning Application
Stage 1- Site Characterisation & Risk Assessment 10
Tier 1 – Preliminary Risk Assessment10
Tier 2 – Site Investigation and Generic Quantitative Risk Assessment 12
Tier 3 – Detailed Quantitative Risk Assessment
Stage 2 – Remediation Strategy & Verification Plan15
Stage 3 – Verification
Unexpected Contamination20
Imported Soils
Cover Systems21
Commensurate Remediation Measures

Introduction

Land contamination is a material planning consideration and as stated in the <u>National Planning Policy Framework</u>:

Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.

Where a proposed end use is considered vulnerable to the presence of contamination, as assessment of the potential risk should be made as part of the planning process.

Contamination is most likely to be present in, on or under the land due to the current or historical use of the land. It may also be present from unregulated or historical filling/land raising, agricultural activities and chemical spillages as a few examples.

As such, any previously used land, often referred as 'brownfield land', has the potential to be affected by land contamination. Contamination can also sometimes be caused by naturally occurring sources such as radon gas from underlying rock or methane from peat deposits.

The purpose of this guidance is to assist developers, landowners, homeowners and consultants who intend to introduce a vulnerable end use (e.g. a residential development) to land or wish to redevelop or significantly change the use of buildings or of land in Bury which could potentially be contaminated.

The guidance specifies what information should be submitted during the planning process for land contamination. All aspects of investigations into possible land contamination should follow the guidelines within <u>Land Contamination: Risk</u> <u>Management</u> (LCRM), from the Environment Agency in line with current best practice. Guidance documents on all aspects can be found on the <u>CL:AIRE Water</u> <u>and Land Library</u>.

Please be aware that investigation and remediation work can sometimes require permits or consents from the Environment Agency or the Local Planning Authority.

Why is Land Contamination a Concern?

A high level overview of why you need to know about land contamination can be found on the <u>Planning Portal</u>.

The presence of contamination does not necessarily present an unacceptable risk. Risk exists when a source (a contaminant) and a receptor (e.g. people, groundwater, rivers or the wider environment) both exist at a site with a pathway linking the two. This is known as a pollutant linkage (also referred to as a contaminant linkage). For example, people can be affected by contaminants in soil by eating vegetables grown in that soil. Contamination may be present in various forms, including chemical, biological or radioactive. Development can create risk by introducing new pathways and also by introducing new receptors. More information is contained within the Preliminary Risk Assessment section on conceptual site models below (see page 10).

Planning

The role of the planning process is to ensure that land is made suitable for its proposed use. The <u>National Planning Policy Framework (NPPF)</u> aims to encourage sustainable development and the reuse of brownfield land. Much of the provisions for land affected by contamination are within <u>Section 15</u>, <u>Conserving and enhancing the natural environment</u>.

Land contamination is a material planning consideration for new developments. As such, all planning applications (including prior approval applications) have to be considered for potential contamination issues to ensure compliance with the <u>Town</u> and <u>Country Planning Act 1990</u>, the NPPF and <u>local planning policies</u>.

The Council's duty is to ensure that owners and developers carry out the necessary investigations and formulate proposals for dealing with any contamination in a responsible and effective manner. In accordance with the NPPF *after remediation, as a minimum, should be enough to ensure that the land is not capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990.* This is the removal of unacceptable risk, making the site suitable for its new use and ensuring that it does not cause pollution of the wider environment.

Officers from the Environment Section at Bury Council, when consulted by the Planning Officer will assess the application and may recommend that further information be submitted or planning conditions be imposed upon the development. Advice can be sought from the <u>Environment Section</u> prior to submitting an application, but please note that there is a charging scheme for pre-application advice and planning condition discharge pre-application advice which can be found on Bury Council's website at: <u>Planning fees - Bury Council</u>.

The Developer's Responsibility

As noted above, the responsibility for securing safe development on land affected by contamination sits with the developer and/or landowner, the developer and/or landowner has to ensure that issues of land contamination are appropriately considered, remediation takes place (where necessary) and that the land is safe and "suitable for use" i.e. the site is cleaned up to a level which is appropriate for the proposed end use.

Furthermore, the developer and/or landowner should ensure that the investigation and remediation of land contamination is carried out by a <u>competent person</u> with a recognised relevant qualification and sufficient experience in contaminated land i.e. an environmental consultant. Carrying out unacceptable or insufficient work or submitting unsuitable or incomplete reports may lead to delays and additional costs. Please note that anonymous or draft reports will not be accepted. Furthermore, the time to review and consider submissions is variable and appropriate timescales should be built into the developer's project plan, noting that early engagement can be beneficial.

Types of Planning Applications

A major application involves any of the following developments:

- Mineral extraction
- Waste development
- Residential development of between 10 or more dwellings
- Residential development on a site area of 0.5 ha or more and the number of dwellings is unknown
- Development of floorspace of 1,000 sq m or more
- Development on sites over 1 ha or more

Minor developments involve:

- Residential development of between one and nine dwellings
- Development where the floorspace is less than 1,000 sq m
- Development on sites less than one hectare
- Gypsy and traveller sites up to nine pitches

Land contamination will also be considered for household extensions and changes of use should they be sited on land with a potentially contaminative former use or have been developed with remedial measures in place.

Completing the "Existing Use" Section of the planning application form

In applying for planning permission applicants have to answer questions regarding contaminated land. Typically, there is a lack of understanding as to what type of development is vulnerable to contamination, if present. If the development proposed includes a residential development and/or any of the sensitive uses listed <u>here</u>, then the answer to the question: "a proposed use that would be particularly vulnerable to the presence of contamination" is always Yes. This is irrespective of the previous use and means that contamination will be considered during the application and it may be prudent to support the application with appropriate information (see the following section on page 6).

The following is a good example of completing this question.

-			
14. Existing Use			
Please describe the current use of the site:			
Vacant derelict brownfield site			
Is the site currently vacant?	🗸 Yes	No	
If Yes, please describe the last use of the site	:		
Former Papermill			
When did this use end (if known)? DD/MM/YYYY (date where known may be approximate)			
Does the proposal involve any of the following? If yes, you will need to submit an appropriate contamination assessment with your application.			
Land which is known to be contaminated?	Yes	🗹 No	
Land where contamination is suspected for all or part of the site?	🗸 Yes	No	
A proposed use that would be particularly vulnerable to the presence of contamination?	🗸 Yes	No	

What to Submit to Support Your Planning Application

The table below describes the information that would be expected to be submitted to support a planning application based on the proposed end use and history of the site. The section on site characterisation and risk assessment (see page 10) provides an overview of the reports listed overleaf.

Application Scenario	Land Contamination information required with an application
Minor Applications	
Change of use to residential (or other more sensitive end-use); or Residential (or other more sensitive end-use) on a greenfield site	Overview of site history (if known) and soft landscaping proposals (including import of materials, if known).
Residential (or other more sensitive end-use) on a brownfield site	Preliminary Risk Assessment.

Application Scenario	Land Contamination information required with an application	
Any new development on a former landfill site	Preliminary Risk Assessment AND Site Investigation and Generic Quantitative Risk Assessment (with adequate gas monitoring)	
Any new development within 50m of a former or current landfill site	Preliminary Risk Assessment AND Site Investigation and Generic Quantitative Risk Assessment (with adequate gas monitoring) unless Preliminary Risk Assessment demonstrates no gassing source	
Any new development on all 'very high' or 'high' risk potential sources of contamination ¹	Preliminary Risk Assessment AND Site Investigation and Generic Quantitative Risk Assessment (with adequate gas monitoring) unless Preliminary Risk Assessment demonstrates a limited or reduced source	
Major Applications		
Residential (or other more sensitive end-use)	Preliminary Risk Assessment.	
Residential (or other more sensitive end-use) on all 'very high' or 'high' risk potential sources of contamination.	Preliminary Risk Assessment AND Site Investigation and Generic Quantitative Risk Assessment (with adequate gas monitoring) unless Preliminary Risk Assessment demonstrates a limited or reduced source	
Any new development on a former landfill site	Preliminary Risk Assessment AND Site Investigation and Generic Quantitative Risk Assessment (with adequate gas monitoring)	
Any new development within 50m of a former or current landfill site	Preliminary Risk Assessment AND Site Investigation and Generic Quantitative Risk Assessment (with adequate gas monitoring) unless Preliminary Risk Assessment demonstrates no gassing source	
Mixed use including residential or commercial, industrial or leisure.	Preliminary Risk Assessment with all applications. Site Investigation and Generic Quantitative Risk Assessment on all 'very high' or 'high' risk potential sources of contamination.	

National Quality Mark Scheme (NQMS) – Greater Manchester Contaminated Land Officer Group Position Statement.

Since the inception of the <u>National Quality Mark Scheme</u> in January 2017, members of officers at Greater Manchester councils have been examining how the scheme is progressing and working in practice. Any scheme aimed at driving up standards in the industry is welcomed providing it is not open to abuse. Unfortunately, very few reports have been submitted to members since its introduction, and as a result there is very little evidence available to guide the group as to whether the scheme has been successful in meeting its objectives or not.

Given the lack of evidence to the contrary, we have decided that reports bearing the NQMS Quality Mark will not be treated any differently to any other report. Officers at Greater Manchester councils will expect all reports with the NQMS mark to be submitted in full and they will be reviewed and considered in light of that individual submission. The role of Local Authority Contaminated Land officers is to regulate land contamination under Part 2A of the Environmental Protection Act 1990, and if reports submitted under these regulations and through the planning process are not scrutinised and the results/conclusions agreed on and documented, we are unable to undertake our regulatory duties properly.

Phased Investigation of Land Affected by Contamination



9

Stage 1- Site Characterisation & Risk Assessment

Tier 1 – Preliminary Risk Assessment

A preliminary risk assessment is the first tier of risk assessment to establish whether there are any potential unacceptable risks. This is done by undertaking a desk study with a site walk over to develop a conceptual site model. The findings are compiled in a Preliminary Risk Assessment (PRA)¹ report which will determine if further investigation is required. Useful reference documents for PRAs can be found <u>here</u>.

A Preliminary Risk Assessment is a prior to commencement requirement.

The submission of a commercial environmental search/conveyancing report on its own is not sufficient to meet the requirements of a Preliminary Risk Assessment report. These reports may contribute useful factual information about the site but do not contain the level of interpretation required for a full Preliminary Risk Assessment.

Desk Study

A desk study is a detailed search of available historical and current records and maps to identify potential on-site and off-site sources of contamination. It should include:

- Appropriately scaled site location and layout plan
- An appraisal of the current land and past uses on and in the vicinity of the site obtained from various sources including historical maps and directories.
- Environmental Setting information such as:
 - o Soils and underlying geology.
 - o Ground gases (including methane, carbon dioxide, radon and soil vapour).
 - o Groundwater and surface water, including abstraction and discharge licences.
 - o Mining or quarrying activities.
 - o Licensed, unlicensed and exempt waste sites (landfill sites).
 - o Details of spillages or pollution incidents.
 - o Environmental Permits.
- Types of contamination that may be present (e.g. heavy metals, petroleum hydrocarbons, polycyclic aromatic hydrocarbons and asbestos).

¹ Also known as a Desk Study, Phase 1 or Geo-Environmental Report

Information may also be held by Bury Council which is not available from external sources and can be provided via an Environmental Search. There is a fee for carrying out Environmental Searches, which can be ordered on Bury Council's website <u>here</u>.

Site Walkover

A site walkover survey should be undertaken to confirm and build upon the information gathered by the desk study. Observations should be made relating to:

- The site's layout, nature and setting (including information on the presence and condition of above-ground fuel tanks and manholes, deposits of waste material and asbestos, and the storage of hazardous chemicals).
- The condition of the site and structures (including the condition of suspected asbestos containing material).
- Visual or odorous evidence of contamination.
- Signs of vegetation distress.
- Descriptions of the site and photographs should be included in the report.

Conceptual Site Model

After carrying out a detailed desk study and site walkover survey, a preliminary conceptual site model should be developed. A conceptual site model is usually a diagram or table that illustrates the potential pollutant linkages at a site. It should include the following, together with details of limitations and assumptions/uncertainties:

- **source** a contaminant or pollutant that is in, on or under the land and that has the potential to cause harm or pollution.
- **pathway** a route by which a receptor is or could be affected by a contaminant.
- receptor something that could be adversely affected by a contaminant, for example a person, controlled waters, an organism, an ecosystem, or Part 2A receptors such as buildings, crops or animals.

Having established potential sources, pathways and receptors a judgement must be made as to whether there are any potential contaminant linkages (i.e. a particular source can affect a receptor via a pathway). There may be sources present but no pathway to link to a receptor etc.

A qualitative risk assessment should be carried out to evaluate the potential contaminant linkages as to whether they require further assessment. It should be based on the potential severity that the hazard poses to the receptors against the likelihood of it happening.

The conceptual site model will enable a preliminary risk assessment to be made, which will indicate whether a site investigation is required. The conceptual site model should be reviewed and revised through the subsequent phases as more information is gathered. It is recommended that before commencing on the next stage of assessment the comments on each submission are read from <u>Bury's planning portal</u>, which can be found by searching under the relevant planning application reference.

Tier 2 – Site Investigation and Generic Quantitative Risk Assessment

If the Preliminary Risk Assessment indicates that there is a potential for contamination to pose a risk to the development, a site investigation will be required to test the conceptual site model, gathering more detailed information at the site. The resulting data from a site investigation initially undergoes generic quantitative risk assessment.

Site Investigation

A site investigation should be designed to determine the nature and extent of contamination where it is present and also areas where it is absent. It is important to refer to the conceptual site model, as this will ensure that all possible pollutant linkages are investigated. Investigations should be carried out in accordance with relevant British Standards and current UK guidance e.g. BS10175, BS5930 and Land Contamination: Risk Management (Environment Agency, 2020).

The proposed site investigation works should be detailed in a scope of works and include the following information:

- The purpose and objectives of the investigation formulated on the basis of the conceptual site model and the information gaps highlighted by the Preliminary Risk Assessment.
- Site investigation methodology, including information and justification of sample locations, depths, patterns and numbers and the frequency and duration of sampling or monitoring to be undertaken. A clear, appropriately scaled plan of exploratory locations should be provided.
- Identify access constraints (i.e. the presence of buildings onsite) and provide details of additional sampling which will be carried out when access is available (i.e. post demolition).
- If demolition is required prior to redevelopment, consider the presence of asbestos containing material and summarise the steps that will be taken to prevent contamination of the soil.
- The contaminants and parameters that will be assessed.
- The likely number of samples (soil, water, leachate and/or ground gas) that will be taken for subsequent laboratory analysis.
- The laboratory methods that will be used. Please note that independently accredited laboratories and analytical methods should be used (e.g. UKAS, MCERTS).

It is recommended that a written scope of works should be submitted to, and agreed with the Environment Section before the commencement of site investigation works. Early consultation is particularly encouraged for large or complex sites with significant contamination issues. Analysis of samples of soil, water and/or ground gases may be required to assess the contamination at a site. Please note that there are numerous sources of ground gases (permanent gases and soil vapours) derived from both natural and human activities. Buried organic matter is of particular concern, as it has the potential to generate methane and carbon dioxide, so sites located in the vicinity of landfills may be at risk from ground gases. Further information is available in British Standard BS8485, CIRIA C665 and <u>NHBC: Hazardous Ground Gas – An Essential Guide for Housebuilders</u>.

Tier 2 - Generic Quantitative Risk Assessment

After approval of the sampling strategy and completion of the site investigation works, the preliminary conceptual site model should be reviewed and updated. It is important to consider each potential pollutant linkage during the risk assessment and decide whether it is active at the site and whether it has the potential to harm the receptor.

A tiered approach to estimating risk should be followed involving the direct comparison between observed levels of contamination and firstly Generic Assessment Criteria (GAC), followed by Detailed Quantitative Risk Assessment if deemed necessary.

Assessing Risk to People (Human Health)

A GAC must be derived from current and authoritative published sources. The most commonly used model for derivation of assessment criteria is the Environment Agency's <u>Contaminated Land Exposure Assessment (CLEA) tool</u>. This has been used to derive Category 4 Screening Levels, <u>C4SLs</u> and Suitable for Use Levels, <u>S4ULs</u>. C4SLs were produced to support Defra's Statutory Guidance as a more pragmatic (whilst still strongly precautionary) approach and have been approved for use in <u>planning</u>. S4ULs were published by LQM and the Chartered Institute of Environmental Health for a minimal or tolerable levels of risks to health. An overview of C4SLs and S4ULs can be found in this <u>information sheet</u>.

If other values are used, they must be adapted to ensure that they are relevant to UK policy and the environment. Justification of their use must also be provided and agreed with Bury's Environment Section.

Where ground gas is identified as a potential risk with a clear identified source, a suitable period of monitoring should be undertaken to characterise the gas regime. BS 8485 should be followed to undertake a risk assessment and calculate the Gas Screening Value (GSV) for a reasonable worst-case scenario. Where appropriate, this can be used to identify what, if any, protection measures are required. Reference can also be made to <u>CL:AIRE Research Bulletin 17</u> for a pragmatic approach regarding gas monitoring and gas protection.

Assessing Risk to Controlled Waters

Controlled waters include, but are not limited to, groundwater, rivers, streams and estuaries. The Environment Agency is the statutory body responsible for the protection and management of these groundwater resources. They are also statutory consultees for certain developments under the Town and Country Planning (Development Management Procedure) (England) Order 2015 and certain aspects of the Environmental Impact Assessments (EIA) Regulations.

As such, in relation to land contamination and the planning regime, the Environment Agency may be asked to act as a consultee and provide advice on risks to controlled waters. Further information on this aspect and what to submit can be found on the <u>Understanding Groundwater Protection</u> section on the Planning Portal.

Please note that the Environment Agency offer a chargeable pre-application service, which is recommended where potentially significant controlled waters issues are present.

Tier 3 – Detailed Quantitative Risk Assessment

Assessing Risk to People (Human Health)

If the observed levels of contamination exceed the GAC, then a more detailed sitespecific risk assessment may be required. Site specific information is needed as input parameters, and you also need to check the sensitivity of any assumptions made and to evaluate any uncertainties and limitations to ensure that the derived site-specific assessment criteria (SSAC) is sufficiently precautionary. The <u>Contaminated Land Exposure Assessment (CLEA)</u> tool can be used. A number of alternative risk assessment models are available including RISC-HUMAN and RBCA. Please ensure that all models are in line with UK policy and include all relevant site-specific pollutant linkages. All risk-modelling assumptions and uncertainties must also be presented and referenced.

Further site investigation maybe needed to provide the detailed site information needed to undertake DQRA.

Assessing Risk to Controlled Waters

Risk assessments for pollution of controlled waters should be done in accordance with the tiered framework set out in <u>Remedial Targets Methodology (RTM)</u> and <u>ground water compliance points: quantitative risk assessment.</u>

Stage 2 – Remediation Strategy & Verification Plan

Remediation Strategy

If the tier 2 and/or 3 risk assessments identifies any unacceptable risks, remediation will be required. Remediation is the "cleaning up" of a site to ensure that the finished development is "suitable for use". Remediation can take many forms such as the removal of the source of contamination or breaking a pathway by inserting a barrier and is entirely site specific.

A remediation strategy should be produced and submitted to the Local Planning Authority for approval prior to commencement of remedial work. A remediation strategy should comprise an options appraisal, remediation objectives, details of the proposed remediation and verification works, mitigation measures, licences/consents and contingency measures.

Options Appraisal

An options appraisal considers the advantages and disadvantages of different remediation techniques, in order to establish the best overall approach to remediate a site. It is important to ensure that the chosen remediation option breaks all of the pollutant linkages that have been shown through the risk assessment to present unacceptable risks. <u>LCRM</u> sets out a staged process for undertaking an options appraisal.

A brief justification as to why a particular remediation technique has been chosen should be included in the remediation strategy. Sustainable remediation, which optimises the use of resources and avoids the waste of materials and energy is encouraged. The appropriate and rational use of detailed quantitative risk assessment can help to ensure that remediation takes place only where it is necessary.

Objectives

A summary of the site investigation(s) should be included, detailing the nature and extent of the contamination found which is to be addressed through the remedial works. The objectives of the remediation works to be carried out to be clearly stated.

Proposed Remediation Works

A detailed explanation of the exact works to be undertaken must be given along with the full method of the processes to be used. This should include:

- Description of ground conditions.
- Details of the type, form and scale of contamination to be remediated.
- Details of the remediation methodology, including remedial, protective or other works.
- Appropriate site plans and/or drawings.
- Proposed phasing of the works and appropriate timescales.

Site management procedures designed to protect site neighbours, the local environment and amenity during works should be provided, including where appropriate:

- Health and safety procedures.
- Appropriate measures to control dust, noise and odours.
- Control of surface run off.

Mitigation measures may have to be incorporated within the development itself to protect future users from any potential contamination, e.g. gas protection systems, cover systems and specific types of drinking water pipes. All such requirements should be clearly detailed in the remediation strategy. Detailed drawings and specifications will need to be agreed alongside the remediation strategy.

A cover system can be employed to break the pollutant linkages in garden and areas of soft landscaping. Information on this is provided on page 21 in this guide.

Proposed Verification Works

Details must be included on how remediation works will be verified to demonstrate the remediation objectives have been met are required and should include details of:

- The sampling strategy chosen.
- Suitable use of on-site observations, including visual and/or olfactory evidence.
- Appropriate post-remediation chemical analysis and/or monitoring data.
- Justification for the proposed clean-up standards including target contaminant concentrations.

If soil verification samples are required, details of these samples should be identified and included within the remediation strategy. Independently accredited laboratories and analytical methods should be used (e.g. UKAS, MCERTS).

If a gas protection system is required, details of how it will be verified should be included within the remediation strategy.

Where ground or surface waters are to be monitored, the locations of sampling points must be clearly stated. Approval from the Environment Agency will be needed for compliance and assessment points.

Some sites may require long term verification monitoring and management. The exact timescales for achieving the remediation criteria must be clearly stated in the remediation strategy. It would be unreasonable to allow verification to continue for a lengthy period of time without an assessment of the progress. If long term groundwater, surface water or gas monitoring is required, details and timescales of interim reports will also be required including interim verification criteria.

Permits

Details of the permits and consents/licences required for the remediation should be included in the remediation strategy e.g. waste management, abstraction/discharge licences. Consideration should also be given to dust, noise and odour controls and the control of any surface run-off from wheel washes, stockpiles etc.

If the <u>CL:AIRE Definition of Waste: Code of Practice</u> is to be for the re-use of material, a copy of the Materials Management Plan and the Qualified Person's Declaration should be provided for information when available.

Contingency Measures and Unexpected Contamination

Contingency measures may be required if remediation is unsuccessful or if unexpected contamination is found during the works. The remediation strategy should include an undertaking detailing that if such circumstances arise, details of the further works required will be submitted to the Local Planning Authority for approval. This is often referred to as a "watching brief for contamination".

The development, including remedial works, cannot commence until the remediation strategy has been submitted and agreed within a discharge of condition application.

Stage 3 – Verification

Verification or validation works, are undertaken following remediation. The purpose is to identify the success or otherwise of remediation works and to identify whether any further remediation or risk management measures are necessary to ensure the site is suitable for its intended use.

On completion of the remediation works a verification report must be submitted. This will detail the remediation and verification carried out as agreed, including evidence that demonstrates whether the remediation objectives have been achieved. Where longer term monitoring is required, e.g. groundwater or gas monitoring, an interim report should be submitted detailing all the verification work undertaken to date. Where the site's remediation criteria have not been met details of the contingency work must be included, these could comprise further detailed quantitative risk assessment, physical remediation works or mitigation measures etc.

An overview of what to include in a Verification Report is provided here in LCRM.

Overview

The verification report should include the details and objectives of the remediation works undertaken on site. This should include a detailed description of all remediation works carried out on site along with any plans, drawings etc to show the areas remediated.

Evidence showing the appropriate installation of gas protection systems, as detailed in the remediation strategy, should be included where necessary. Guidance on the verification of gas protection systems can be found in BS8485:2015, CIRIA C735 and also <u>YALPAG's Technical Guidance</u>. Training and advice on best practice can be sought from the <u>British Verification Council</u>.

Analytical results for all verification samples should be included within the report with a detailed comparison and interpretation against the remediation criteria, which were agreed in the remediation strategy.

If the remediation criteria have not been met, further work will be required to ensure that the site is suitable for its intended use. This may involve undertaking further detailed risk assessment, returning to undertake further remediation at the site or installing some form of mitigation method, e.g. a barrier to prevent users being impacted by the contamination. Discussions should be held with the Environment Section as soon as possible once it is known that the remediation works have not met the targets, to agree the extent of work required to make the site suitable for its intended use.

The report should detail whether all pollutant linkages have been broken or effectively controlled and whether the site is suitable for its intended use. An updated conceptual site model should also be included.

On completion of remediation and verification works a verification report must be submitted prior to first use or occupation of the development to be considered to discharge the planning condition. For larger sites a phased submission of information can be considered but should be agreed within the verification plan.

Non-submission of a verification report when required by planning condition is breach of planning and may result in enforcement action. It can result in failed environmental searches for house purchasers, the loss of house sales and blight of properties. It is the responsibility of the developer to ensure that a verification report is submitted when required.

Unexpected Contamination

A watching brief for unexpected contamination should be carried out during all excavation works on a sensitive end use development, irrespective of whether or not remedial measures are required.

Unexpected contamination may include:

- soils stained by oil/fuel,
- uncharacteristically coloured liquids/soils or groundwater,
- anthropogenic waste such as fragments of asbestos sheeting
- putrescible material
- pungent or pleasant odours arising from the soil or groundwater.

Imported Soils

It may be necessary to import soils to site for use in a cover system as a remedial action or to replace unsuitable soils and/of if there is a deficit on site and it is required for as a growing medium to provide a healthy and sustainable garden. The import and reuse of soils should be in accordance with the Waste Management Regulations. Guidance on this can be sought from the Environment Agency for permitting and exemptions or by following <u>CL:AIRE's Definition of Waste: Code of Practice</u>. Any imported soils should be demonstrated to be suitable for use and free of contaminants.

It is recommended that a number of samples are taken at the source of the material, and then further sampling undertaken once the material has arrived at the site. This ensures that any non-compliant material is not imported to site, therefore negating the need for removal back off site (which can take time and add cost to a development, in addition to the problem of potentially contaminating a clean site).

Minimum Testing Frequency

The frequency of testing should normally be undertaken in line with the following minimum framework. However, we would strongly recommend that we should be consulted, and sampling requirements agreed, prior to work commencing on site. The assessment criteria proposed to be used should also be agreed prior to work or chemical analysis commencing.

Material Source/Type	Minimum Testing Frequency
Proven Greenfield	Topsoil - 1 sample per 250m ³
	Subsoil - 1 sample per 250m ³
Brownfield, manufactured or	Topsoil - 1 sample per 50m ³
site-won	Subsoil - 1 sample per 100m ³
Hardcore/crush (e.g 6F2)	1 sample per 1000m ³

Notes

- Minimum of 3 samples per source
- Testing suite should include heavy metals, Polycyclic Aromatic Hydrocarbons (PAHs: USEPA 16), SOM and Asbestos for all sources/materials.
- Speciated Total Petroleum Hydrocarbons (TPHs) for all fractions of aliphatic and aromatic hydrocarbons should be included within the testing suite for a brownfield source.

Healthy and Sustainable Soils

As well as soils being suitable for use and not contaminated, soils must be healthy and present in sufficient quantity for a sustainable landscape. Soils must meet the requirements of the British Standard for topsoil (BS 3882:2015) and subsoil (BS 8601:2013) (including the need to be free of sharps such as glass fragments) and both need to be present in garden and landscaped areas. The depth of growing medium should take into account rooting depths for any proposed planting. Section A.3 of BS 3882:2015 for topsoil gives an indication of rooting depths (450mm for grass, 600mm for shrubs and 900mm for trees). The depth of topsoil should not normally exceed 300mm.

Well structured, healthy soils are essential to the realisation of all nature-based solutions to climate change and guidance can be found in Defra's <u>Construction Code</u> <u>of Practice for the Sustainable Use of Soils on Construction Sites</u>.

Cover Systems

Cover systems can be employed as a remedial action to break the pathway between contaminant and receptor. This maybe a simple system of an appropriate depth of clean validated soil comprising both top and subsoil and with a sufficient rooting depth for the proposed planting. Engineered designs. The design and verification plan of a cover system should be agreed as part of the <u>Remediation Strategy within</u> <u>Stage 2</u>. Ideally the depth should be tested in every plot. Verification information should be submitted and agreed prior to first occupation. Further information on the design and verification of cover systems can be found in <u>NCLOG's Regulator Guide</u>.

Commensurate Remediation Measures

A condition maybe applied to extensions where remedial measures have been incorporated into the dwelling and/or garden when first built. The means of how to continue and not compromise these protective measures will need to be agreed ahead of works commencing. You will also need to ensure that the construction of extensions does not in any way compromise the effectiveness of existing gas protection measures (e.g. by blocking vents to the underfloor void or damaging existing membranes). As a general principle, ground gas protection measures for extensions to buildings and properties must at least match those of the original development to ensure continued protection.

With regards ground gas details of membranes and vented subfloor voids will need to be considered. A starting point will be plans and cross sections, if available, illustrating how the existing measures have been installed and details of any membranes that have been used and what gases and vapours they are resistant to should be provided. This information will enable foundation details of the extension to be developed which should illustrate how the existing protection measures will be continued into the extension. This must include how any membranes will be appropriately keyed into the existing buildings. Technical specifications of the proposed membrane will also be required. Verification of the installation of these measures will also be required as per good practice of ground gas installations.

