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Guidance

LCRM: Before you start

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Land contamination can harm:

- human health
- drinking water supplies, groundwater and surface water
- soils
- ecosystems including wildlife, animals and wetlands
- property

It can also affect the current and future land use.

Dealing with land contamination helps make the environment clean and safe. Through regeneration it can:

- enhance the health and wellbeing of all
- add to the economic, ecological and amenity value of the area

Use land contamination risk management (LCRM) to:

- identify and assess if there is an unacceptable risk
- assess what remediation options are suitable to manage the risk
- plan and carry out remediation
- verify that remediation has worked

You can use LCRM in a range of regulatory and management contexts. For example, voluntary remediation, planning, assessing liabilities or under the Part 2A contaminated land regime.

The Environment Agency expects you to follow LCRM if you are managing the risks from land contamination.

We support the use of the National Quality Mark Scheme (NQMS). You can use it for any type of land contamination report.

Using the NQMS:

- will make sure all legislative requirements and necessary standards related to managing land contamination are met
- can provide increased confidence by submitting reports of the quality we expect
- can result in cost and time savings by 'getting it right first time'

Using the LCRM guides

LCRM is made up of 4 guides.

1. LCRM: Before you start.
2. LCRM: Risk assessment.
3. LCRM: Options appraisal.
4. LCRM: Remediation and verification.

We use a staged risk based approach. There are 3 stages and each stage is broken down into tiers or steps.

Stage 1: Risk assessment

You will use a tiered approach to risk assessment. The 3 tiers are:

1. Preliminary risk assessment.
2. Generic quantitative risk assessment.
3. Detailed quantitative risk assessment.

Stage 1 includes information for intrusive site investigations.

Stage 2: Options appraisal

There are 3 steps to follow.

1. Identify feasible remediation options.
2. Do a detailed evaluation of options.
3. Select the final remediation option.

Stage 3: Remediation and verification

There are 4 steps to follow.

1. Develop a remediation strategy.
2. Remediate.
3. Produce a verification report.
4. Do long term monitoring and maintenance, if required.

Overview of LCRM

You must always start with a preliminary risk assessment.

The risk assessment stage is an iterative process. You can do the 3 tiers in order or progress from a preliminary risk assessment to a detailed quantitative risk assessment. As part of a generic or detailed quantitative risk assessment you will need to collect detailed information about the site. This is usually through an intrusive site investigation.

Depending on the level of risk or regulatory requirements, you can proceed from a preliminary risk assessment to the options appraisal stage. If you proceed direct to the options appraisal stage, you still need to collect the detailed site investigation information required by the generic and detailed quantitative risk assessments. This is to confirm that your approach is viable and acceptable.

Following the risk assessment stage, if you conclude that the risks are acceptable, with agreement from the relevant regulator, you can end the process.

If there are unacceptable risks then remediation or mitigation is required. Follow stages 2 and 3 in order.

In stage 2 options appraisal, you will:

- look at the most feasible options

- produce a shortlist of options
- use evaluation criteria to assess them
- select which ones are the most suitable to take forward to stage 3

In stage 3 remediation and verification, you will produce a remediation strategy, do the remediation and then produce a verification report.

You will decide at the options appraisal stage if long term monitoring and maintenance is the remediation option. You may need to do post-remediation monitoring for further verification.

We have provided checklists at the end of each stage which you can use to help you include the required reporting information.

Who should use LCRM

LCRM is relevant to all those involved in or responsible for managing land contamination. These include:

- landowners
- regulators
- developers
- planners
- an 'appropriate person' under Part 2A
- consultants
- professional advisors such as a financial service provider
- remediation contractors

We expect that the person responsible for applying LCRM is appropriately competent in the tasks they are doing for each stage.

Competent person

For land contamination and planning you must use and meet the National Planning Policy Framework definition of a competent person given in annex 2 (<https://www.gov.uk/guidance/national-planning-policy-framework/annex-2-glossary>).

For all other regimes, we expect you to have appropriate knowledge, skills, experience and qualifications in the:

- specific area of LCRM you are doing
- type of contamination you are dealing with

You may demonstrate this with qualifications and experience in a specific technical or scientific discipline or application, or by multidisciplinary qualifications. These include for example:

- a Suitably Qualified Person (SQP) registered under the NQMS
- the Society of Brownfield Risk Assessment (SoBRA) (<https://sobra.org.uk/resources/reports/>) accreditation scheme
- a Specialist in Land Contamination (<https://www.silc.org.uk/>) (SiLC)

- membership of a professional organisation relevant to land contamination
- a proven track record of dealing with land contamination

A proven track record means a regulator or consultant who regularly deals with land contamination. For example, someone with knowledge and experience of the Part 2A regime or someone who regularly deals with the technical aspects of land contamination.

National Quality Mark Scheme

You can decide to use the **NQMS** for reporting requirements. This is a voluntary scheme set up by the National Brownfield Forum and administered by CL:AIRE.

The Environment Agency and the SoBRA accreditation scheme support its use. The scheme can provide increased confidence and ensure that the submitted reports are of the quality we expect.

You can use the **NQMS** for any type of land contamination report you produce.

The **NQMS** uses a **SQP** (<https://www.claire.co.uk/projects-and-initiatives/nqms/83-supporting-sqp-process/271-what-is-a-suitable-qualified-person>) who is an experienced professional in the field of land contamination.

The registered **SQP** will quality check your land contamination reports. They will:

- verify that all factual and interpretative information meets the required technical and regulatory standards
- provide a declaration that the reports have been checked and verified under the scheme

If you decide to use the **NQMS** you will:

- still need to get your reports reviewed by the relevant regulator
- have to pay a small administration fee

For more details on the **NQMS** see the:

- CL:AIRE website (<https://www.claire.co.uk/projects-and-initiatives/nqms>)
- position statement J9: **NQMS** for land contamination – see section J Environment Agency' s approach to groundwater protection (<https://www.gov.uk/government/publications/groundwater-protection-position-statements>)

Sustainability

We support a sustainable approach to land contamination risk management.

The industry-led Sustainable Remediation Forum UK (**SuRF-UK**) has produced a framework for assessing the sustainability of soil and groundwater remediation (<https://www.claire.co.uk/projects-and-initiatives/surf-uk/20-framework-and-guidance/89-framework-document>).

This framework complements **LCRM**' s risk based approach and we support its use.

It sets out why sustainability issues associated with remediation need to be factored in from the start of a project through to completion.

You can use the framework and supporting materials to help you to:

- identify at an early stage how you can embed sustainability at a number of key points in a site's redevelopment or risk management process
- make sure the process balances the environmental, social and economic impacts and generates maximum overall benefit
- factor in climate change to ensure site works and any long term remediation is sustainably robust

Find more information on SuRF UK (<https://www.claire.co.uk/projects-and-initiatives/surf-uk>) on the CL:AIRE website.

You can also use BS ISO 18504: Soil quality – sustainable remediation (<https://shop.bsigroup.com/ProductDetail?pid=000000000030275832>).

Defining the term 'land contamination'

The term 'land contamination' used in this guidance applies to:

- all land affected by contamination – land that might have contamination present which may, or may not, meet the statutory definition of contaminated land
- land determined as contaminated land under Part 2A of the Environmental Protection Act 1990

For Part 2A you will need to evaluate if the presence of a substance (a contaminant) which is in or under the land has the potential to cause significant:

- harm or the significant possibility of significant harm to human health
- pollution or the significant possibility of significant pollution to controlled waters

Causes of land contamination

Land contamination can be caused for example, by:

- pollution incidents such as accidents, spills, deposits from the air
- contamination from historical industrial land use
- historical mine workings
- contaminant migration overland or by infiltration into the ground
- high levels of naturally occurring substances
- historical waste deposits such as former landfills

You may need to manage potential land contamination:

- as part of a planning application for redevelopment
- as a Part 2A obligation
- as voluntary remediation
- as a regulatory requirement such as compliance with an anti-pollution works notice or where remediation is required through environmental permitting site condition reporting

- to address a pollution incident
- for building regulations
- for the purchase, transfer or sale of the land or property or to support funding decisions
- for valuation or insurance purposes

Developers, operators and landowners are expected to:

- prevent new pollution and if it occurs, clean it up quickly
- manage existing land contamination using the principles in this guidance
- seek specialist advice, if required

Deal with new pollution

New pollution could result from a:

- pollution incident
- breach in a permit condition

If you have caused the pollution you must:

- identify the source and clean it up quickly
- return the site to its original state and deal with any adverse effects its caused
- put measures in place to prevent it happening again
- where appropriate comply with the Environmental Damage (Prevention and Remediation) Regulations (<https://www.gov.uk/government/publications/environmental-damage-prevention-and-remediation-regulations-2009-guidance-for-england-and-wales>)

Call the Environment Agency incident hotline (<https://www.gov.uk/report-an-environmental-incident>) to report damage or danger to the natural environment or pollution to water or land.

For more details see:

- pollution prevention for businesses (<https://www.gov.uk/guidance/pollution-prevention-for-businesses>)
- position statement J1: Promptly clean up new contamination – see section J Environment Agency’s approach to groundwater protection (<https://www.gov.uk/government/publications/groundwater-protection-position-statements>)

Manage existing contamination

Existing contamination is also called historical contamination.

To manage existing contamination:

- identify the type and extent of contamination

- assess the level of risk to receptors
- decide if that risk is unacceptable

If the risk is unacceptable you must:

- assess what remediation options are suitable
- plan and carry out remediation
- verify that remediation has been, and will continue to be, effective

If you need to remediate, consider:

- any regulatory and legal requirements such as fulfilling a planning condition, a Part 2A obligation or a wider water resources protection requirement
- the overall site objectives – which you will define in the preliminary risk assessment
- reasonableness of remediation – how practicable, effective and durable it is
- how technically feasible it will be
- the costs and time involved
- the views of stakeholders
- any uncertainties or limitations such as unexpected contamination, unknown sub-surface processes, complex hydrogeology or contamination, long-term changes in groundwater levels
- a sustainable approach

For land contamination and planning see the:

- revised National Planning Policy Framework (<https://www.gov.uk/government/collections/revised-national-planning-policy-framework>)
- planning practice guidance (<https://www.gov.uk/government/collections/planning-practice-guidance>) which includes a guide on land affected by contamination (<https://www.gov.uk/guidance/land-affected-by-contamination>)

When dealing with Part 2A you must also refer to the contaminated land statutory guidance (<https://www.gov.uk/government/publications/contaminated-land-statutory-guidance>).

For radioactive contaminated land you must contact the Environment Agency and then use the radioactive contaminated land statutory guidance (<https://www.gov.uk/government/publications/statutory-guidance-covering-radioactive-contaminated-land>).

For more information on our approach to land contamination see section J of the Environment Agency's approach to groundwater protection (<https://www.gov.uk/government/publications/groundwater-protection-position-statements>).

Local authorities and other regulators may also provide additional guidance.

Quality of information and degree of confidence

As you progress through LCRM, the range and level of information you collect will need to meet appropriate quality criteria. It must be:

- relevant to the stage, tier or step you are doing
- reliable in reflecting true or likely conditions
- transparent in meaning and origin
- sufficient for the required degree of confidence
- robust for decision making

You must understand the degree of confidence needed for each decision. For example, the regulator will need a high level of certainty to ensure compliance and that risks have been satisfactorily assessed.

The degree of confidence required will be site-specific. Greater hazards or more sensitive receptors will need a high degree of confidence. The quality of data you collect will affect later stages of LCRM.

Uncertainties and limitations

Land contamination is often not visible. In many cases you will have to base your assessment on the prediction of risk. When you collect data and analyse it, you must identify any uncertainties and limitations of that data and any possible consequences.

Data collection from intrusive site investigation, sampling, analysis and the use of models or other tools to estimate risk can have limitations and result in uncertainty.

You may find uncertainties about:

- the presence or extent of the contamination
- subsurface geology and groundwater conditions
- analytical and sampling results
- how realistic model results are
- if in practice, a particular treatment option will reduce or control risks to the required level

You may be able to reduce or clarify some uncertainties. For example, you can:

- do an exploratory, detailed or supplementary investigation
- define identified contaminant sources in more detail
- do model calibration, derive statistical confidence limits and a sensitivity analysis
- consider treatability studies or pilot trials

Other uncertainties may only need a qualitative characterisation such as setting high, medium or low degrees of confidence on information or judgements.

You must record all uncertainties and limitations and identify the possible consequences of these throughout the risk management process.

Communicate the risk

The potential or actual presence of contamination may have consequences for a wide range of people. This includes the local community, residents, organisations and businesses.

They may have concerns about:

- the potential risk to human health, animals and the environment
- the impact on property values
- possible short and long term disruption

Keep these parties informed of any risks and proposed works throughout each stage.

You may need to develop a risk communication strategy. For guidance see INFO PM3: communication (<https://www.claire.co.uk/useful-government-legislation-and-guidance-by-country/203-communication-info-pm3>) on the CL:AIRE Water and Land Library.

British Standards and other guidance you can use

We have kept the same reference system as that on the CL:AIRE Water and Land Library (<https://www.claire.co.uk/information-centre/water-and-land-library-wall>).

We have referenced British Standards and CIRIA guidance where their use is relevant. You have to purchase these. There may be other standards and guidance you can use.

The general investigation standards are:

- BS 10175: Investigation of potentially contaminated sites – code of practice (<https://shop.bsigroup.com/ProductDetail?pid=000000000030362551>)
- BS 5930: Code of practice for ground investigations (<https://shop.bsigroup.com/ProductDetail?pid=000000000030268443>)

For conceptual site models see BS EN ISO 21365: Soil quality – Conceptual site models for potentially contaminated sites (<https://shop.bsigroup.com/ProductDetail?pid=000000000030364954>).

Soil quality standards include:

- BS EN ISO 15175: Soil quality – characterisation of contaminated soil related to groundwater protection (<https://shop.bsigroup.com/ProductDetail?pid=000000000030338450>)
- BS EN ISO 16133: Soil quality – guidance on the establishment and maintenance of monitoring programmes (<https://shop.bsigroup.com/ProductDetail?pid=000000000030352176>)
- BS ISO 18400 series – Soil quality sampling series (<https://shop.bsigroup.com/SearchResults/?q=BS+ISO+18400>)
- BS ISO 15800: Soil quality – characterisation of soil with respect to human exposure (<https://shop.bsigroup.com/ProductDetail?pid=000000000030368502>)
- BS ISO 18504: Soil quality – sustainable remediation (<https://shop.bsigroup.com/ProductDetail?pid=000000000030275832>)

Water quality sampling standards include the documents under BS 5667. This is a multipart document and includes for example:

- BS ISO 5667-11: Water Quality, Sampling – Guidance on sampling of groundwaters (<https://shop.bsigroup.com/ProductDetail?pid=000000000030152313>)

- BS ISO 5667-22: Water Quality, Sampling – Guidance on the design and installation of groundwater monitoring points (<https://shop.bsigroup.com/SearchResults/?q=5667-22>)
- BS EN ISO 5667-6: Water Quality, Sampling – Guidance on sampling of rivers and streams (https://shop.bsigroup.com/en/ProductDetail/?pid=000000000030329721&_ga=2.227262941.1309657748.1589182312-208901667.1549440036)

Ground gas standards and guidance include:

- BS 8485: Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings (<https://shop.bsigroup.com/ProductDetail?pid=000000000030377237>)
- BS 8576: Guidance on investigations for ground gas – permanent gases and volatile organic compounds (<https://shop.bsigroup.com/ProductDetail?pid=000000000030248027>)
- CIRIA C665: assessing risks posed by hazardous ground gases to buildings (<https://www.ciria.org/ItemDetail?iProductCode=C665&Category=BOOK&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91>)
- CIRIA C735: good practice on the testing and verification of protection systems for buildings against hazardous ground gases (<https://www.ciria.org/ItemDetail?iProductcode=C735&Category=BOOK>)

For unexploded ordnance you can use CIRIA C681: Unexploded ordnance (UXO) – a guide for the construction industry (<https://www.ciria.org/ItemDetail?iProductcode=C681&Category=BOOK>).

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