Thanet District Council

Developer's Guide

Contaminated Land

Developer's Guide for Contaminated Land

Introduction

This guidance is aimed at owners, property developers, architects and surveyors who want to know what information they should submit to the Planning Department when they apply to re-develop, or significantly change the use of a piece of land, which could potentially be contaminated. Contamination is most likely to arise from previous industrial use of the site or adjacent sites or from known pollution incidents.

The onus for cleaning up such land under the planning process is not the same as cleaning up land under Part IIA of the Environment Protection Act 1990 – although the information we would request is similar. The conditions for cleaning up land under the planning process are that: **As a minimum, after the new development is completed, the land should be suitable for its new use and not meet the legal definition of contaminated land under Part IIA of the EPA 1990**.

The revised National Planning Policy Framework 2018 (Chapter 15) also requires that developments 'conserve and enhance the natural environment'. Section 170(f) requires that planning policies should enhance the natural environment by remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.

This information is for guidance purposes only. We are aware that the contents of any site investigation report will vary due to site-specific issues, e.g. the past use of the site, the nature and extent of the contamination and the proposed end use of the site. Developers are therefore recommended to seek the advice of an Environmental Consultant and the Environmental Protection Team if it is suspected that contamination may exist. At all times, it is the responsibility of the developer to comply with current legislation.

This guidance document aims to outline the information required by Local Planning Authorities (LPA) in order for them to determine planning applications and then the subsequent discharge of associated land contamination conditions. This guidance document provides an overview of good practice for land contamination management procedures which, if followed, will help meet the information requirements of the LPA during development of that land.

At all times, it is the responsibility of the developer to follow good practice and identify the nature, scale and extent of land affected by contamination, and if required, undertake remediation work to ensure suitability of the land for the proposed development. The LPA does not have a duty of care to the landowner.

Thanet's Heritage

In common with many other parts of the country, Thanet has a proud legacy of industrial activity dating back over the last few hundred years. During this time, Thanet has been home to numerous industries, including mining, manufacturing, construction, farming, gas works, chemical works and military activities. The infilling of former clay and sand pits has also taken place in Thanet.

In the past there were far fewer restrictions on industry than are in place today and many facilities operated with little regard to their impact on the environment. These former industrial activities may have left contamination in the ground, which if not properly dealt with can pose a risk to public health or the environment. The type of contamination can vary substantially from site to site, but some of the more common causes for concern include heavy metals (e.g. mercury and lead), hydrocarbons (e.g. oils, fuels and solvents) and domestic and industrial wastes. There is also the possibility of encountering Unexploded Ordinance (UXO) in Thanet, as with other parts of the South East, particularly around former military installations like Manton Airport due to its role in WWII.

The Developer’s responsibilities

The Government recognises that land contamination is a material planning consideration and that the development phase is the most cost-effective time to resolve any problems. The Government’s approach is set out in the revised National Planning Policy Framework 2018.

It is the developer’s responsibility to ensure that the development is safe and that the Local Planning Authority is satisfied that any risks from potential contamination have been adequately addressed. To this end, the developer should carry out a satisfactory assessment of the site, considering the potential for contamination, including an intrusive ground investigation, where necessary, to confirm the level and extent of any contamination.

If significant contamination is identified, then appropriate remediation should be undertaken to render the site suitable for its intended use. Failure to properly address contamination issues during development could lead to a future liability under the Contaminated Land Regulations (Part IIA of the Environmental Protection Act 1990). Other liabilities may arise from the subsequent pollution of controlled waters, failure of building materials or civil claims resulting from alleged health effects.

In addition, the developer has a responsibility to protect the welfare of construction workers operating on potentially contaminated sites and to adequately manage other potential environmental impacts of development, such as dust and odour, as well as the appropriate management and disposal of any contaminated spoil.

The Council's Approach

Whilst this Authority supports proposals for the redevelopment of brownfield sites, the potential for land to be contaminated is an essential consideration for the purposes of Planning, and it places the responsibility on owners and developers to establish the extent of any potentially harmful materials on their sites.

As regulators, it is the Local Authority's duty to ensure that owners and developers carry out the appropriate investigations and formulate proposals for dealing with any contamination in a responsible and effective manner. It is necessary to ensure that land is, or will be made, suitable for any proposed end use. During liaison with your environmental consultant, it is required that you assess the potential risks of contamination on the basis of the proposed end use of the site and in relation to local environmental circumstances.

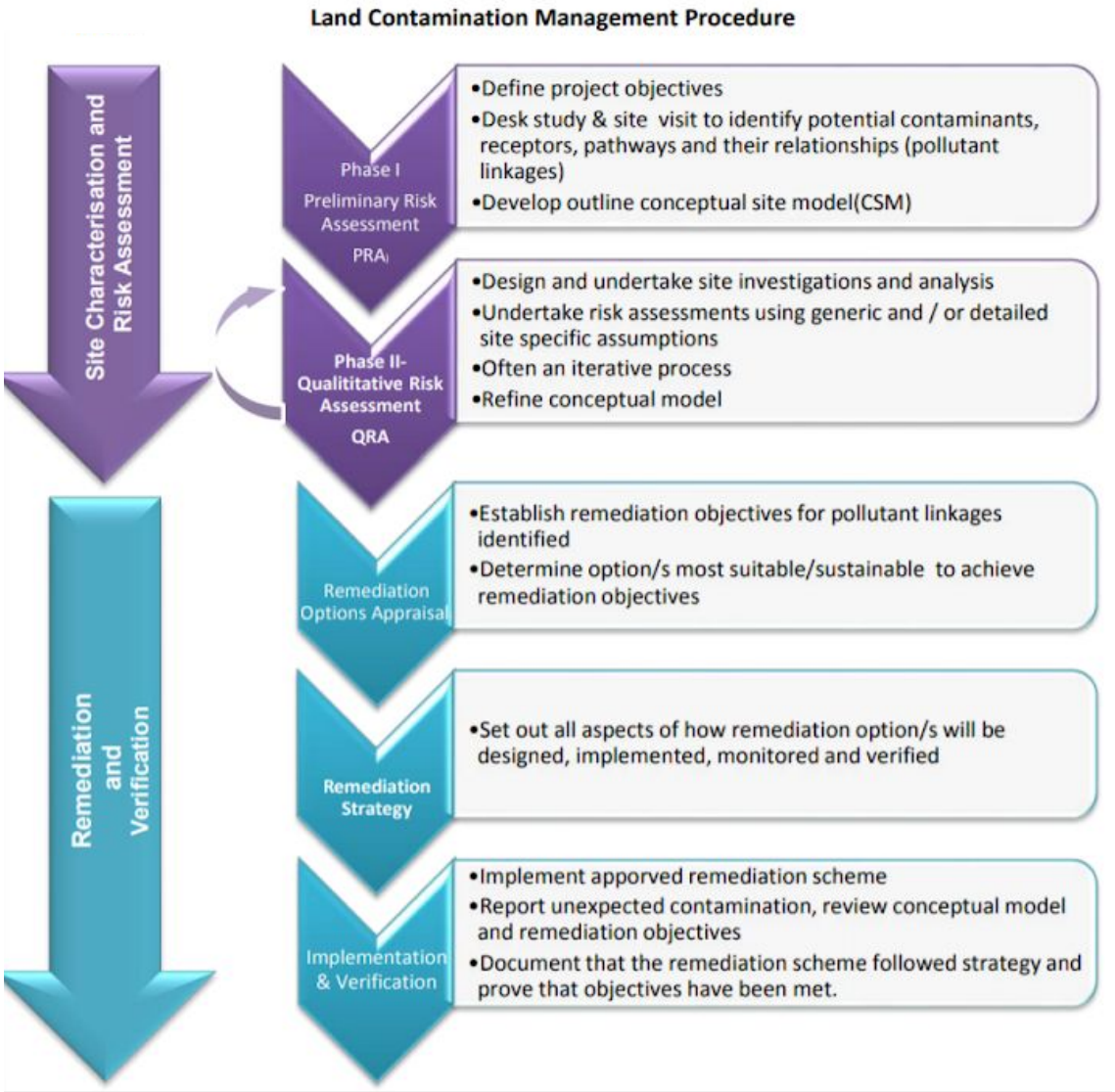
This can be done before formal planning permission is given for the development. However, in some circumstances, permission can also be granted subject to a condition, which will require you to investigate whether any land contamination exists and, if necessary, devise a strategy to deal with it. If potential risks are identified, the land will then need to be remediated, as part of the development process, to mitigate risks to human health and the environment, including controlled waters.

Liaison with the Council

Where a developer is proposing to develop land that is suspected of being contaminated, it is advisable to contact the Environmental Protection Team before submitting the planning application. It is useful to do this as the Council may have additional information that you are unaware of, and will also be able to answer any particular questions that you have in relation to this process. During site investigation works (e.g. sample collection) and remedial works (e.g. installation of gas resistant membranes), the Environmental Protection Team may wish to visit the site.

It would therefore be useful to know when this work is timetabled to take place. This will also give further opportunity to discuss any problems or queries that may have arisen. The flow diagram below provides a summary of the steps that are required when dealing with a site where contamination is suspected. More detailed information on the full nature of this process can be found in the appended checklists or via:
https://www.gov.uk/guidance/land-contamination-how-to-manage-the-risks

Dealing with Land Affected by Contamination



Pollutant Linkages

Government policy in relation to land affected by historic contamination is founded on a ‘suitable for use’ approach. This approach informs consideration of sites on land affected by contamination under each of the three main drivers for assessment and remediation, namely:

1. Voluntary action;
2. Development under the planning regime; and
3. Regulatory action to mitigate unacceptable risks, for example, under Part 2A of the Environmental Protection Act 1990.

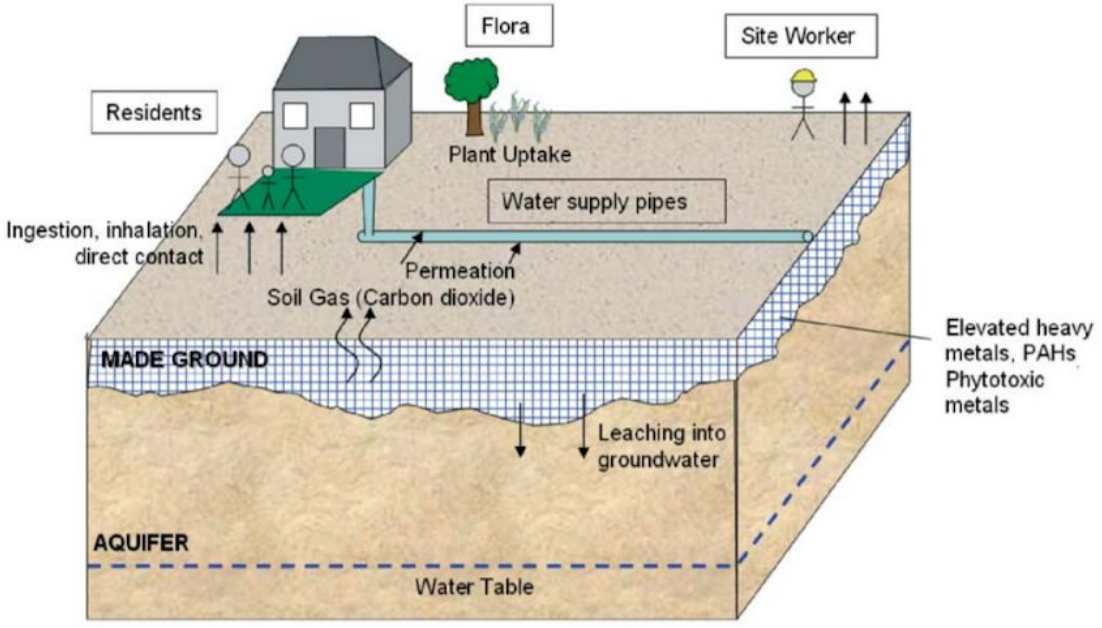
In order for a risk to be realised related to land affected by contamination, a ‘pollutant linkage’ must exist. A pollutant linkage requires the presence of:

• a source of contamination;
• a receptor capable of being harmed; and
• a pathway capable of exposing a receptor to the contaminant

A ‘source’ of contamination can be defined as a harmful or toxic substance present in the ground (as a solid, liquid or gas/vapour). A ‘receptor’ can be a person, an environmental subject (groundwater, surface water, flora or fauna) or a building/structure. The exposure pathway can be direct (e.g. skin contact with contaminated soils) or indirect (e.g. movement of a contaminant source through air, as contaminated dust, or via water) eventually to impact the receptor.

An example of possible pollutant linkages in a simplified “Conceptual Site Model” is illustrated below. By consideration of the sources, pathways and receptors in each pollutant linkage, an assessment can be made of the significance and degree of risk.

Conceptual Site Model (CSM)



The Presence of Contamination

Contamination may be present at a site (in the ground and/or in the underlying groundwater) as a result of a historic or current industrial use. Typically such contamination is present because of leaks, spills or disposal of residue, wastes and excess raw materials. Contamination may also be present due to:

• the purposeful application of chemicals (e.g. the spraying of herbicide/pesticide);
• migration from adjacent land; or
• naturally occurring processes (e.g. elevated concentrations of particular heavy metals associated with specific geological strata).

Risk Assessment

Phase I - Preliminary Risk Assessment

Risk assessments help you decide whether land contamination is currently a problem, and/or is likely to be a problem during and/or following development of the site. Understanding the risks is the first step in the process of managing land contamination.
The purpose of the preliminary risk assessment is to develop an outline conceptual site model and identify all plausible contaminant-pathway-receptor pollutant linkages at the site. This will be a qualitative (descriptive) assessment of risk.

The main activity at this stage is a 'desk study', comprising the collection of all readily available historic and environmental information. A site walkover survey is also usually undertaken, to verify the desk based information and observe any visual signs for contamination. It may also aid design of the subsequent investigation by providing information that may limit or restrict the initial scope (for example access restrictions, services, location of concrete structures that may need penetrating). As above, the conceptual site model is an understanding of the three-dimensional site characteristics (usually expressed through visual representation), which identifies potential sources of contamination, receptors, contaminant migration or exposure pathways, and shows the possible interaction between them (potential pollutant linkages), taking into account the current and proposed uses of the site. The development of the conceptual model is an iterative process, which should be re-addressed and refined with each subsequent phase of assessment.

It is anticipated that a preliminary risk assessment will be required for most cases of development on brownfield land, and further assessment is required if there are any gaps in the preliminary risk assessment, or if the preliminary risk assessment identifies any potential unacceptable risks. A high degree of confidence in the preliminary risk assessment findings is usually required to demonstrate that any other outcome is acceptable. Please refer to Checklist 1 at Appendix 1 when submitting reports.

Phase II - Quantitative Risk Assessment

Phase II site investigation and risk assessment should be undertaken where the preliminary risk assessment identifies any potential unacceptable risks, or to reduce uncertainty in the initial conceptual model. The investigations should aim to provide information to refine and update the outline conceptual model, confirm and evaluate the significance of the identified potential pollutant linkages.

The scope of the site investigation should be designed around the preliminary conceptual model and should be agreed with Environmental Protection prior to undertaking the works. The site investigation should meet the requirements of the Code of Practice for Land Contamination of Potentially Contaminated Land BS10175 and an MCERTS accredited laboratory must be used for analysis of soil samples.

The site investigation may be an iterative process, undertaken in several phases depending on the requirements for further reducing uncertainty in the conceptual model and refining the risk assessment from a generic quantitative risk assessment to a detailed quantitative risk assessment using site specific assessment criteria. Additional site investigation may also be required to provide data to inform the Remediation Options Appraisal

Human Health Assessment

The EA Science Report SCO50021 series of documents, SR2 to SR7 listed below, provides guidance on assessing the risks to human health. The SR documents are authoritative and have a published scientific basis, and therefore meet the requirements of the risk assessment framework set out in DETR (2000).

The SR guidance is currently considered 'best practice' in the assessment of contaminated land in the UK.
SR2 - Human Health Toxicological Assessment of Contaminants in Soil
SR3 – Updated Technical Background to the CLEA Model
SR4 - CLEA Software Handbook (V 1.05) CLEA Software Version 1.071
SR7 - Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values

Category 4 Screening Levels (C4SLs)
The Statutory Guidance for the assessment of contaminated land was revised by Defra in order to give greater clarity to regulators as to how to decide when land is and is not actually contaminated land. The revised Statutory Guidance introduced a new four category system for classifying land as contaminated under Part 2A of the Environmental Protection Act 1990. Please see further information on appropriate standards under FAQs and recent EA guidance at Appendix 2.

Controlled Waters Assessment

There are many methods and tools available, but you should choose ones that are appropriate for the UK risk management framework. EA documents that describe approaches or tools for water risk assessment include:

Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination (2006)
Petroleum Hydrocarbons in Groundwater: Supplementary Guidance for Hydrogeological Risk Assessment (2010)
*Technical Advice to Third Parties on Pollution of Controlled Waters for Part 2A of the Environmental Protection Act 1990 (2002**

Further information and links relating to controlled water risk assessments can found on the CL:AIRE website http://www.claire.co.uk/useful-government-legislation-and-guidance-by-country/77-risk-assessment-info-ra/208-assessing-risks-to-the-water-environment-info-ra2-3

Please refer to Checklist 2 in Appendix 1 when submitting information in regards to a Phase II Preliminary Risk Assessment

Remediation

Remediation Options Appraisal

Where the quantitative risk assessment identifies that the nature and extent of land contamination is unacceptable for its intended end use, then remediation works will be required. The first stage is to establish the site specific remediation objective(s) that are required to address each pollutant linkage. Remediation criteria should be derived for measuring compliance against, which must be agreed with Environmental Protection, as appropriate. In order to avoid delays and additional expense for the developer, it is recommended that site specific remediation objective(s) and remediation criteria are agreed in advance by the LPA consultees.

A list of feasible remediation options should be produced for appraisal in order to establish which are most appropriate for addressing each pollutant linkage. The merits of each option should be assessed by compiling detailed technical information. The evaluation should also take account of the best practicable environmental option, cost benefit, environmental outcomes, site specific constraints and appropriate timescales for remediation, including obtaining likely regulatory requirements and permits.

The options appraisal should establish which option or combination of options will most effectively achieve the remediation objective(s).

Please refer to Checklist 3 in Appendix 1 when submitting information with regards to Remediation Options Appraisals.

Remediation Strategy

The remediation strategy sets out how the remediation option or combination of options, will address pollutant linkages and agreed remediation criteria. The strategy should provide a clear picture of how remediation activities will be planned for, implemented, monitored and verified. Practical issues such as phasing of activities, plans for obtaining appropriate environmental permits, compliance monitoring, contingency plans and mitigation measures etc. should be all addressed within the remediation strategy.

It is essential for the developer to demonstrate to the LPA that the remediation activities will be capable of achieving the agreed remediation criteria, without posing unacceptable risk to third

parties or the environment, that appropriate permits will be obtained, contingency plans are in place and mitigation measures will be implemented if there are significant variations from the remediation strategy.

Please refer to Checklist 4 in Appendix 1 when submitting information with regards to a Remediation Strategy.

Remediation Scheme

During development, Environmental Protection should be notified immediately under circumstances where contamination not previously identified is found to be present at the site. No further development (unless otherwise agreed in writing) shall be carried out until the developer has submitted, and obtained written approval from the LPA for a remediation strategy detailing how this unsuspected contamination shall be dealt with.

Verification Report

Upon completion of the remediation works, a verification report must be submitted to the LPA consultees for review and approval. The verification report should provide a full record of all remediation activities carried out at the site and demonstrate that the agreed remediation criteria and objectives have been achieved.

Long Term Monitoring and Maintenance

Following completion of remediation works, where there is a requirement for long term maintenance and/or continued monitoring to demonstrate the effectiveness of those works, a separate ‘Monitoring and Maintenance Plan’ should be produced and submitted to Environmental Protection for approval by the LPA.

Submission Guidelines

The Environmental Protection Team will be happy to discuss findings, proposals and other issues at any stage of the development. Formal submission of reports, for the purposes of discharging planning conditions, should be made directly to the relevant Planning Officer. Additional requirements may be required regarding submission of reports to the Environment Agency.

The Role of other Organisations

The Environment Agency is a statutory consultee for many planning applications where development is proposed on potentially contaminated land close to groundwater source protection zones or surface water features like streams or canals. The Environment Agency has a duty to protect groundwater and surface waters and the developer will need to ensure that any concerns of the Environment Agency are satisfied.

The Building Control inspector will also need to be satisfied that any risks to the development from potential contamination have been adequately addressed. The Building Regulations require that builders demonstrate that hazards from potential contamination have been properly assessed and appropriate measures put in place to address any risk. Most new building warranties require some level of assessment to be carried out if contamination is suspected at the site.

Discharge of Conditions

Upon receipt of a satisfactory Phase I - Desk Study Report or Phase II – Site Investigation, indicating no further investigation or remediation is necessary, or a satisfactory verification report following remediation work, the Environmental Protection Team will recommend discharge of the relevant planning condition. This will be implemented on a phased basis as specified by the conditions.

If required, a phased discharge of conditions will be endorsed by the Environmental Protection Team, detailing the information submitted to the Local Planning Authority for the purpose of achieving discharge of the contaminated land planning condition imposed on the development and/or acceptance of remediation for NHBC requirements. No other warranty or indemnity from future regulatory action is intended by a phased discharge of conditions. **The Environmental Protection Team will make a recommendation for discharge of the full condition only upon receipt and approval of a satisfactory verification report.**

Frequently Asked Questions

1. Who should conduct this work?

The person or organisation carrying out the work must have the experience, qualifications and skills to do so and must meet the following criteria:

1. They should be a 'suitably qualified competent professional' with a relevant qualification - usually an environmental scientist, chemist or hydrogeologist.
2. They must belong to an accredited professional body or must be able to demonstrate that they operate within a quality assurance system;
3. They must use an accredited and quality assured laboratory (UKAS/MCERTS) to analyse samples and prepare conclusive reports;
4. They must be aware of current legislative requirements including health and safety and the relevant codes of practice.
5. They must be able to carry out risk management assessments and produce clear reports on the findings.
6. They must have, and maintain, appropriate professional indemnity insurance.

National Quality Mark Scheme

Please note, the National Quality Mark Scheme (NQMS) was launched in January 2017. It is a system designed by the industry led Land Forum to ensure that land contamination management work meets the necessary technical and regulatory standards. It applies in particular to presentation of information to the regulator in the form of reports, setting out both factual and interpretative information. Reports are prepared in line with good practice and signed off by a suitably qualified and experienced person (SQP) registered under the NQMS. It is hoped its use will assist in the prompt discharge of planning conditions.

2. Why might the Planning Authority deem a report to be inadequate?

There are several reasons why a Planning Authority may reject a report, for example:

1. It does not contain all the information required;
2. Some of the information is not presented clearly and requires clarification;
3. Important maps are missing;
4. The report does not sufficiently address the concerns of the Planning Authority.

The Planning Authority will then contact you with details of why it has been rejected and ask you to re-submit an amended copy. If you are unclear about anything, you should make an appointment to meet with the relevant officer.

3. Apart from the local Planning Authority, who else should I be consulting?

It may be appropriate to consult a number of statutory bodies including the Environment Agency, Southern Water and Natural England. The planning authority will also consult other departments within the Council, for example, Environmental Health.

The Environment Agency has a number of regulatory responsibilities. They must, therefore, be consulted if it is possible that:
1. The pollution of surface or groundwater is involved;
2. The water environment is at risk of pollution;
3. An application is within a flood-plain area;
4. Where the development is on a closed landfill or on/within 250 metres of an active landfill.
N.B. Planning Liaison at the Environment Agency can provide further details on what they should be consulted on. Please contact: kslplanning@environment-agency.gov.uk. If remediation works are required, it may be necessary to inform neighbouring residents – the Local Planning Authority will be able to advise you further on this.

4. What are the effects of contaminated land?

If the land is contaminated it may present a hazard to potential uses of the land. Exposure to contaminants may occur through inhalation (e.g. of dust or gasses), direct contact with soil, through ingestion of food grown on the land, etc. as indicated in the 'source-pathway-receptor' Conceptual Site Model.

Leachates (pollutants draining from the site in liquid form) can pollute groundwater and rivers or ponds. Some contaminants may be corrosive, and some can pose a risk of explosion or fire. Contamination within the soil and unsaturated zone can potentially have an impact on groundwater quality, this can move off-site and affect nearby surface water features as well as abstractions.

5. What are the appropriate standards to use?

In December 2002, the Department for the Environment Food and Rural Affairs, officially withdrew the Interdepartmental Committee for the Redevelopment of Contaminated Land (ICRCL) guidance note 59/83 (2nd Edition), therefore these are no longer valid and must not be used. In addition, the Dutch Standards are not officially recognised as being authoritative standards in this country. Since 2002, the Environment Agency has used the Contaminated Land Exposure Assessment (CLEA) model to determine soil guideline values, which are soil concentrations that represent a minimal risk to human health. A report by Land Quality Management (LQM) and the Chartered Institute for Environmental Health (CIEH) provides an updated assessment of suitable for use levels in soils (S4ULs) for 89 substances.

LQM/CIEH previously published two editions of Generic Assessment Criteria (GAC) in 2006 and 2009, respectively. These GAC complemented the available SGVs produced by the Environment Agency (EA) from 2002 onwards. Since the 2009 edition of the LQM/CIEH GAC report, several changes have occurred in the contaminated land risk assessment sector and various revised values for exposure, toxicology and physicochemical parameters have been adopted in the UK. In December 2013, DEFRA produced Category 4 Screening Levels (C4SL) for assessment of land affected by contamination. This approach included new exposure land uses for public open space, suggested modifications to the exposure parameters, and set the toxicity value at low risk rather than the minimal risk adopted in the derivation of other GACs. Given these developments, LQM/CIEH published a report on Suitable 4 Use Levels in January 2015.

An S4UL is a soil concentration that represents a minimal risk to long term human health. The methodology for deriving the S4ULs is based on a modified version of the Environment Agency CLEA model. The S4ULs were derived using an iterative approach including modification of the exposure parameters in the CLEA model. The report includes suitable-for-use levels (S4UL, a type of GAC) for 89 substances including metals, total petroleum hydrocarbon fractions (aromatic and aliphatic), polycyclic aromatic hydrocarbons, and chlorinated hydrocarbons. The S4UL values were derived for six generic land uses: residential with and without home-grown produce, commercial, allotments, and public open space as parks and as land adjacent to residential dwellings.
Please ensure that all soil sample results are assessed in accordance with the appropriate methodology. If using CLEA software, workings must be provided. Where Soil Guideline Values (SGVs) are not available for the appropriate pollutants, suitable site specific criteria must be derived in accordance with 'Human Health Toxicological Assessment of Cotmainants in Soil' (see: www.gov.uk/government/collections/land-contamination-technical-guidance) and submitted for our approval. Alternatively, if it can be shown that CLEA is not the appropriate model to use then other appropriate packages (with the Council's agreement) can be used (e.g. SNIFFER). Your Environmental Consultant will be able to advise you further on these requirements.

6. What will happen if I do not submit a desktop study and information relevant to any site investigation?

If a desktop study is not submitted and information is not included as part of the site investigation information, then one of two things is likely to happen:

1. You will receive a letter from the Planning Department informing you that you must supply it before the condition can be discharged. The condition will not be discharged until the planning authority is satisfied that all information has been provided.
2. Enforcement Action for non-compliance with a planning condition.

Selected Guidance and References

BS 10175:2011+A2:2017 Code of Practice for the investigation of potentially contaminated sites.
BS 8576:2013 Guidance on Investigations for Ground Gas. Permanent Gases and VOCs
CAR, 2012. (2012). The Control of Asbestos Regulations 2012. UK.
CIRIA. (2007). C665, Assessing Risks Posed by hazardous ground gases to buildings.
CL:AIRE. (n.d.). The Definition of Waste: Development Industry Code of Practice.
Ministry of Housing, Communities and Local Government. (2018). revised National Planning Policy Framework.
DEFRA / EA. (2002). Potential Contaminants for the Assessment of Land, CLR 8.
DEFRA / EA. (September 2004). The 'Model Procedures for the Management of Land Contamination', Contaminated Land Report 11 (CLR 11) and updated DEFRA / EA (June 2019) Land contamination: Risk Manangement guidance.
https://www.gov.uk/guidance/land-contamination-how-to-manage-the-risks
DEFRA. (April 2012). Environmental Protection Act 1990: Part 2A. Contaminated Land Statutory Guidance.

DEFRA, SP1010 – Development of Category 4 Screening Levels for assessment of land affected by contamination, updated in September 2014.
Department of the Environment (DoE). (1995). Industry Profiles – various.
EA. (2006). Remedial Targets Methodology 'Hydrogeological Risk Assessment for Land Contamination'.
EA. (2017, March 14). Retrieved from GOV.UK: https://www.gov.uk/government/collections/groundwater-protection
EA. (January 2009). Updated technical background to the CLEA model (Science Report Final SC050021/SR3).
EA. (July 2003). Consultation on Agency Policy: Building Development.
EA. (May 2014). New groundwater vulnerability mapping methodology. Report: SC040016.
EA. (October 2008). Guidance on desk studies and conceptual site models in ecological risk assessment. Science Report - SC070009/SR2a.
EA/NHBC . (2008). R&D Publication 66 - Guidance for the Safe Development of Housing on Land Affected by Contamination.
Environment Agency. Guidance on pollution prevention associated with piling and other ground improvement techniques: Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination Report NC/99/73.
Health and Safety Executive. HSG 264. Asbestos: The Survey Guide.
LQM/CIEH, 'Suitable 4 Use Levels' http://www.lqm.co.uk/publications/
Natural England et al. MAGIC. Retrieved from MAGIC: http://www.natureonthemap.naturalengland.org.uk/home.htm
Public Health England. UKradon. http://www.ukradon.org/
The Coal Authority. Interactive Map Viewer. http://mapapps2.bgs.ac.uk/coalauthority/home.html

Other Resources

British Geological Survey - www.bgs.ac.uk/
CIRIA Contaminated Land – www.ciria.org/
CI:aire (Contaminated Land Applications in Real Environments) – www.claire.co.uk
Department of Environment, Food and Rural Affairs (DEFRA) - http://www.defra.gov.uk/
Environment Agency - http://www.environment-agency.gov.uk/
Ends Directory for Environmental Consultants – https://www.endsdirectory.com/
Land Quality Management (LQM) – www.lqm.co.uk
National Planning Policy Framework (NPPF): https://www.gov.uk/government/publications/national-planning-policy-framework--2
Thanet District Council Contaminated Land webpage: https://www.thanet.gov.uk/info-pages/contaminated-land/

Contact Details

Environmental Protection Team
Thanet District Council
PO Box 9, Cecil Street, Margate,
Kent, CT9 1XZ

E-mail: **Environmental.Health@thanet.gov.uk**
Tel: 01843 577580

Environment Agency

Endeavour Park, London Road,
Addington, West Malling,
Kent, ME19 5JH
E-mail: **enquiries@environment-agency.gov.uk**
Tel: 08708 506506

Southern Water Enquiries

Tel: 0330 303 1263
www.southernwater.co.uk/technical-enquiries

thanet
district council

Appendix 1 - Checklist for reports submitted in support of Planning Applications

CHECKLIST 1

Phase I - Preliminary Risk Assessment / Desk Study Objective: to obtain a good understanding of site history, setting, current and proposed use. Draw up an outline conceptual model to establish any relevant pollutant linkages in the contaminant-pathway-receptor human health and environmental risk assessment. Identify if further investigation and or remediation is required. Reporting requirements:	Date Provided
· purpose and aims of the study	
· credentials of person undertaking the study	
· site location and current layout plans (appropriately scaled and annotated with north point, National Grid Reference (minimum 6 figures) and site area in hectares)	
· description of site and surrounding land uses	
· appraisal of site walkover survey	
· review of site history including appropriately scaled and annotated historical maps and aerial photographs where available	
· details of current and proposed site use	
· assessment of the environmental setting including the interpretation and implications of: • the geology, hydrogeology and hydrology of the area • information from the Environment Agency on abstractions, pollution incidents, water quality classification, landfill sites within 250 metres and flood risk • whether there are any archaeological or ecological considerations	
· review of any previous site contamination studies (desk based, intrusive, or IPPC investigations where relevant) and remediation works	
· review of local authority planning records, building control records, drainage and service plans	
· identification of potential contaminants of concern and source areas	
· preliminary (qualitative) assessment of risks, to include: • outline conceptual model to show the nature and extent of the potential contamination and • an appraisal of the potential relevant pollutant linkages (contaminants, pathways and receptors)	
· identification of information gaps and uncertainties, recommendations for intrusive contamination investigations (if necessary) to include the	

identification and justification of target areas for more detailed investigation	

CHECKLIST 2

Phase II - Quantitative Risk Assessment / Site Investigation Objective: to refine and update the conceptual model, provide detailed sitespecific information on substances in, on or under the ground, geology and groundwater, confirm relevant pollutant linkages, evaluate potentially unacceptable risks through generic or detailed quantitative risk assessment and provide the basis for the Options Appraisal. Reporting requirements:	Date Provided
· purpose and aims of the study	
· credentials of person undertaking the study	
· site location and current layout plans (appropriately scaled and annotated, with north point, National Grid Reference (minimum 6 figures) and site area in hectares)	
· review and summary of any previous reports with references	
· results of preliminary risk assessment and summary of outline conceptual model	
· liaison with the Local Authority Environmental Protection	
· site investigation methodology to include: • any preparatory enabling works e.g. breaking out concrete and demolition • an appropriately scaled and annotated plan showing exploration locations, sample points, site structures, above/below ground storage tanks and existing services, infrastructure etc.	
· justification of both targeted and grid-based sampling strategies, including the location, depth and number of samples taken • method of forming exploratory holes e.g. boreholes/trial pits and borehole/trial pit logs, showing water strikes and installation details as appropriate. • details of surface/groundwater monitoring programmes according to relevant Environment Agency methodology • methods of collecting, storing and transporting samples to laboratory • description of site works and observations	
· justification of analytical strategies, including the selection of parameters and the selection of samples for additional tests such as leachability	
· analysis of samples to be carried out by an MCERTS accredited laboratory for soils and must include: • all contaminants of concern identified in preliminary risk assessment • where relevant, the speciation for grouped determinands to allow for quantitative risk assessment e.g. polyaromatic hydrocarbons (PAHs), total petroleum hydrocarbons (TPH), polychlorinated biphenyls (PCBs)	

▪ results and findings of investigation to include: • description of ground conditions (made ground / soil and perched / groundwater regimes, including interactions between them) • flood risk • discussion of nature and extent of contamination - sensory field evidence and analytical, a summary of the phases (solid, dissolved, free and the potential mobility and leachability of contamination) • meaningful comparison (i.e. to include statistical tests as per UK guidance) of the analytical results to appropriate standards, with full justification of the standards chosen • to include consideration of ground gas and the presence of asbestos	
▪ evaluation of site investigation results against conceptual model	
▪ site specific risk assessments for both health and environmental receptors. To include: • objectives and details of proposed site use • details of the models selected and justification of choice for the site • justification for input parameters, with source reference for literature values and additional calculations for field derived parameters, assumptions, safety factors • any model printouts that have been generated (e.g. with the Contaminated Land Exposure Assessment Model CLEA and Remedial Targets Methodology, the data worksheets should be included) • parameter sensitivity analysis and validation reports to show that the model is performing accurately • note, where non-UK models are used, it will be important to make modifications to them ensuring compliance with UK policy. DEFRA publishes relevant guidance in CLR 7 to 11	
▪ an interpretation and discussion of the findings of the investigation and risk assessment with identification of pollutant linkages that present unacceptable risk and discussion of uncertainties	
▪ recommendations, description and uncertainties for further investigations or next steps as appropriate • meaningful comparison (i.e. to include statistical tests as per UK guidance) of the analytical results to appropriate standards, with full justification of the standards chosen • to include consideration of ground gas and the presence of asbestos	
▪ evaluation of site investigation results against conceptual model	

▪ site specific risk assessments for both health and environmental receptors. To include: • objectives and details of proposed site use • details of the models selected and justification of choice for the site • justification for input parameters, with source reference for literature values and additional calculations for field derived parameters, assumptions, safety factors • any model printouts that have been generated (e.g. with the Contaminated Land Exposure Assessment Model CLEA and Remedial Targets Methodology, the data worksheets should be included) • parameter sensitivity analysis and validation reports to show that the model is performing accurately • note, where non-UK models are used, it will be important to make modifications to them ensuring compliance with UK policy. DEFRA publishes relevant guidance in CLR 7 to 11	
▪ an interpretation and discussion of the findings of the investigation and risk assessment with identification of pollutant linkages that present unacceptable risk and discussion of uncertainties	
▪ recommendations, description and uncertainties for further investigations or next steps as appropriate	

CHECKLIST 3

Remediation Options Appraisal Objective: to establish which remediation option, or combination of options, provides the best approach to remediating all pollutant linkages that present an unacceptable risk at the site, whilst meeting best practice and current technical guidance. Reporting requirements:	Date Provided
▪ purpose and aims of the report	
▪ credentials of person compiling the report	
▪ site location and current layout plans (scaled and annotated, with north arrow, National Grid Reference (minimum 6 figures), site area in hectares)	
▪ review and summary of all previous reports with references	
▪ results of site investigation and quantitative risk assessment report and summary of conceptual model	
▪ liaison with the Local Authority Environmental Protection	
▪ summary of relevant pollutant linkages that require remediation	
▪ outline of remediation objectives - what remediation needs to achieve for each pollutant linkage	
▪ outline of remediation criteria - against which compliance for each pollutant linkage can be measured and statement of overall site remediation criteria	
▪ identification of feasible remediation options	
▪ detailed evaluation of remediation options	

· description of remediation strategy, including: • justification for selection and how remediation strategy will deliver overall site remediation criteria • technical and scientific basis, effectiveness of combining remedial options, constraints and limitations, expected durability • site plan/drawings (appropriately scaled and annotated) • preparatory works, phasing of remedial works and timescales • consents and licenses (e.g. discharge consents, part B authorisation for mobile plant, waste management licences/ exemptions, asbestos waste removal licence) • site management measures to protect neighbours, environment and amenity during works, including where appropriate: health and safety procedures, discharges to air, land and water including dust, noise, odour, surface water run off, discharges to groundwater with environmental controls and monitoring	
· outline of how remedial strategy will be verified and future monitoring requirements	
· details on the lifespan of the remediation strategy	
· note: If changes are made to the remediation strategy they must be agreed with the local planning authority before they are implemented, justification will be required, with description of how the amended strategy will meet the agreed remediation criteria	

CHECKLIST 4

Remediation Strategy Objective: to clearly translate the remediation strategy into a clear set of remediation activities for the site. It should set out all aspects of the design, preparation, implementation, verification and long-term monitoring and maintenance of the remediation strategy. Reporting requirements:	Date Provided
· purpose and aims of the report	
· credentials of person compiling the report	
· site location and current layout plans (appropriately scaled and annotated, with north point, National Grid Reference (minimum 6 figures) and site area in hectares)	
· review and summary of all previous reports with references ¾ liaison with the Local Authority Environmental Protection	
· description of ground conditions including geology, hydrology and hydrogeology	
· remediation objectives; criteria for relevant pollutant linkages and overall site criteria	
· remediation methodology	
· site zoning and phasing with approximate timescales	
· preparation works and operational constraints	
· specific site management procedures and emergency contingency plans	

· site management measures to protect neighbours, environment and amenity during works, including where appropriate: health and safety procedures, discharges to air, land and water including dust, noise, odour, surface water runoff, discharges to groundwater with environmental controls and monitoring	
· location and construction details of monitoring activities eg. dust gauges, vapour monitoring, groundwater boreholes	
· details of permits and licences in place and how compliance will be demonstrated	
· detailed site plans/drawings (appropriately scaled and annotated) showing areas requiring remediation, locations and phasing of works, stockpiling, monitoring and sampling points	
· details of what constitutes completion of remedial works and how completion will be verified	
· details of the Verification Plan in order to demonstrate that the remediation criteria has been met for each relevant pollutant linkage, including details of: • the sampling and monitoring strategy, methods and frequency • validation testing of excavations to remove material, treated material, imported material, effectiveness of gas management systems etc. • water quality testing of background groundwater and proximal surface waters, plus treated waters • the use of on-site observations, visual/olfactory evidence • schedule of chemical analysis, demonstrating accordance with MCERTS for soils and laboratory QA/QC • performance testing methods e.g. for containment barrier (cut off wall, gas membrane) and capping layer • confirmation by independent consultant that remedial measures proposed ie for gas, soil or water contaminants are incorporated into the design as planned or as per manufacturers specification. Any deviation to this being justified. • proposed actions in the event that verification shows failure of remediation criteria	
· details of future monitoring and or maintenance requirements in a Monitoring and Maintenance Plan (where necessary) once remediation has been completed, including details of : • explanation as to why work is required • scope of sampling and monitoring and / or maintenance, methods, frequency and type of equipment to be used • statement and justification for end-point for monitoring programme • proposed assessment criteria and justifications for selection • schedule of chemical analysis, demonstrating accordance with MCERTS for soils and laboratory QA/QC • measures for ensuring required monitoring / maintenance is undertaken	

CHECKLIST 5

Verification of Completion Objective: to clearly demonstrate that the remediation activities have been completed satisfactorily, have not caused harm to third parties and the environment and that the remediation criteria for each of the relevant pollutant linkages have been met. The Verification Report should include:	Date Provided
· purpose and aims of the report	
· credentials of person compiling the report	
· site location and current layout plans (appropriately scaled and annotated, with north point, National Grid Reference (minimum 6 figures) and site area in hectares)	
· review and summary of all previous reports with references	
· liaison with the Local Authority Environmental Protection	
· information as detailed in the remediation strategy including description of relevant pollutant linkages assessed, i.e; • description of ground conditions including geology, hydrology and hydrogeology • remediation objectives; criteria for relevant pollutant linkages and overall site criteria • remediation methodology	
· details of remedial work undertaken and by whom, with justification for any changes from the original remediation strategy	
· results of verification, validation, performance testing and monitoring as specified in the Verification Plan: to include substantiating data: • laboratory and in-situ test results, monitoring results for groundwater and gases during remediation • summary data plots and tables relating to remedial criteria • plans showing treatment areas and details of any differences from the original remediation strategy • details of permits, licences, waste management documentation etc. and demonstration of compliance	
· description of reinstatement works	
· description of final site conditions at completion with details of any permanent installations that form part of the remedial strategy and are to be left intact	
· confirmation that remediation objectives have been met and confirmation of post-completion monitoring/ maintenance requirements	

Appendix 2 – Risk Assessment Guidance from the Environment Agency (June 2019)

How to assess if there's unacceptable risk, decide which options are the most suitable to manage the risk and implement remediation if needed.

Background
This guidance is based on the Model procedures for the management of land contamination - contaminated land report (CLR11), which will be withdrawn in Q4 2019. The scope, framework and purpose remain the same. To find more information see the CL:AIRE news item.

Manage land contamination
Land contamination can cause unacceptable risks to the environment and to people.
Dealing with land contamination helps make the environment clean and safe. Through regeneration it can:

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

Use the principles in this guidance to:

- assess the risks
- make appropriate decisions
- take action where necessary

You can use this guide in a range of regulatory and management contexts such as voluntary remediation, planning, assessing liabilities or under the Part 2A contaminated land regime.
The Environment Agency expects you to follow this guide if you're managing the risks from land contamination.

Before you start
What you need to know before you start the risk management process.
You may need to manage or deal with land contamination if you're a:

- landowner
- developer
- planner
- regulator
- 'appropriate person' under Part 2A
- professional advisor such as a financial service provider

Use a suitably qualified competent professional
A suitably qualified and competent person must for example:

- have a recognised relevant qualification
- have sufficient experience with risk management and the type of contamination you're dealing with
- be a member of a relevant professional organisation

Stage 1: Risk assessment

How to do a land contamination risk assessment (RA).
You can only do a land contamination risk assessment if you're a suitably qualified competent professional.
The 3 tiers of RA are:

1. Preliminary risk assessment (PRA) - first tier of RA that develops the outline conceptual model (CM) and establishes whether there are any potentially unacceptable risks.
2. Generic quantitative risk assessment (GQRA) - carried out using generic assessment criteria and assumptions to estimate risk.
3. Detailed quantitative risk assessment (DQRA) - carried out using detailed site-specific information to estimate risk.

In all cases, you must start with a PRA.
The RA stage is an iterative process. It's normally followed in order but depending on the level of risk, you can jump a tier or proceed to the options appraisal (OA) stage. For example, you can proceed from a PRA to DQRA or OA.
If you do not follow the tiers in order, for example you proceed direct to the OAstage, you'll still need to collect the detailed information required by the GQRA and DQRA.
To do a land contamination RA you must:

- identify the reasons for doing the RA
- identify contaminants and pollutant linkages
- assess and evaluate the risk to establish whether there is an unacceptable risk

When you've completed the RA, if there are unacceptable risks you must follow stages 2 and 3 in order.
If you establish that the risks are acceptable, with agreement from the relevant regulator (such as the local authority or the Environment Agency) you can end the process.

Technical approach to risk assessment
For each tier of RA you must:

1. Identify the hazard - establish contaminant sources.
2. Assess the hazard - use a source-pathway-receptor (S-P-R) pollutant linkage approach to find out if there is the potential for unacceptable risk.
3. Estimate the risk - predict what degree of harm or pollution might result and how likely it is to occur by using the tiered approach to risk assessment.
4. Evaluate the risk - decide whether a risk is unacceptable.

The meaning of the terms are:

- hazard: a property or situation that in particular circumstances could lead to harm or pollution
- risk: a combination of the probability, or frequency of occurrence of a defined hazard and the magnitude of the consequences of the occurrence
- risk assessment: the formal process of identifying, assessing and evaluating the health and environmental risks that may be associated with a hazard
- risk management: the formal process of identifying, assessing and determining risks, and the selection and implementation of actions to mitigate them

Evaluate the risk
You will evaluate the risk using risk assessment evaluation criteria.

These are the parameters used to judge whether particular harm or pollution needs further assessment or is unacceptable. The criteria you use will relate to the type of harm or pollution you're dealing with. The receptors involved could be controlled waters, human health, ecosystems or property. Any evaluation criteria you use must be relevant to your site.
The exact choice of evaluation criteria will depend on:

- the reasons for doing the RA and the regulatory context such as Part 2A
- the CM and pollutant linkages present
- any criteria set by regulators
- any advisory requirements such as from Public Health England
- the degree of confidence and precaution required
- the level of confidence required to judge whether a risk is unacceptable
- how you've used or developed more detailed assessment criteria in the later tiers of RA
- the availability of robust scientific data
- how much is known - for example, about the pathway mechanism and how the contaminants affect receptors
- any practical reasons such as being able to measure or predict against the criteria

For example, for Part 2A you will need to evaluate whether the presence of contamination is causing significant harm or the significant possibility of significant harm to human health. The evaluation criteria you use will establish whether the site is contaminated land under that regime.
The criteria are measures of a risk of harm or pollution to the receptor and can be:

- minimal or negligible
- tolerable or acceptable
- unacceptable

Evaluation criteria are set in relation to a level of harm or pollution to the specified receptor. They may be translated into:

- absolute standards or recommended maximum values and are measured in relation to the receptor - for example, a health criteria value for the intake of a substance measured in relation to the receptor
- guideline values or mandatory values for the concentrations of the contaminant in the soil, groundwater or air

For PRA, you will normally evaluate the risks qualitatively.
If you progress to a quantitative GQRA or DQRA, you will use evaluation criteria to judge whether particular harm or pollution needs further assessment or is unacceptable.
Evaluation criteria include GQRA generic assessment criteria (GAC) and DQRA site-specific assessment criteria (SSAC).
For example, evaluation criteria for the risk to human health from exposure to contaminants are often based on direct intakes via pathways such as ingestion and inhalation. In this context, GAC and SSAC are the calculated levels in soil above which may present an unacceptable risk of harm to human health. The evaluation criteria will take into account different land uses and the type and sensitivity of the human health receptor.
If GAC or SSAC are exceeded, you will need to evaluate if that level of risk is acceptable and whether further assessment is needed.
Evaluation criteria may also be used directly. For example, using a drinking water standard to evaluate whether the predicted level of a contaminant in groundwater at a compliance point is acceptable.

It's important that you understand any underlying assumptions and take them into account when you interpret the results of your GQRA or DQRA.
Examples of evaluation criteria include:

- category 4 screening levels (C4SL) and LQM/CIEH Suitable for Use Levels (S4ULs)
- human health toxicological assessment of contaminants in soil (SR2) tolerable daily intakes and index doses
- SSACs derived using remedial targets methodology (RTM) and a regulatory compliance point
- drinking water standards
- ecosystem end-points which take into account the ecological value of a site - for example, used under Part 2A for assessing significant harm to ecosystems

You:

- can find more detailed technical guidance on the CL:AIRE Water and Land Library (WALL) - see risk assessment (INFO-RA)
- must, for Part 2A, use the contaminated land statutory guidance

Tier 1: Preliminary risk assessment (PRA)
You must always start with a PRA. This will establish whether there are any potentially unacceptable risks arising from contamination at the site.
To complete a PRA you need to:

- define the overall site objectives
- collect current and historical information about the site and the potential contaminants expected to be present
- develop an outline CM
- assess the risks qualitatively
- record your findings in your PRA report and decide what further action is needed

Define the overall site objectives
You must understand the reason for doing the assessment from the person who has commissioned it. This could be the:

- land owner
- regulator
- potential purchaser
- developer
- 'appropriate person' for Part 2A

You must understand their objectives and the scope of assessment required.
For example:

- a local authority may require a limited assessment because the site is of a lower priority than other Part 2A sites in its inspection strategy
- developers may require a more detailed assessment to fulfil a planning condition
- the assessment of a former industrial site for redevelopment (as part of a planning application) may have a different scope than one carried out for valuation purposes

Possible overall objectives for the site could be to:

- meet regulatory requirements or to anticipate regulatory action
- assess the site for Part 2A

- ensure the site is suitable for redevelopment
- take voluntary action to manage the risks
- assess the site to support funding decisions
- assess the site to comply with or surrender a permit
- get a valuation, for example for insurance, sale or transfer purposes or to address any liability issues
- reassess any previous assessment of the site

You will need to know the required timescales, for example if it's:

- an immediate, medium or long term risk
- related to a current use or future change of use of the site

You will need to establish the level of technical confidence needed, for example if it's:

- low, medium or high
- preliminary, indicative or comprehensive

You will need to understand any constraints on time or cost.

Collect information for PRA

You collect information via a:

- desk study
- site walkover

Use this information to:

- interpret historical, archived and current information to establish the location of previous site activities
- understand the environmental setting of the site
- identify areas or zones that contain distinct and different types of contamination
- identify pollutant linkages using a S-P-R approach
- develop an outline CM
- scope out the likelihood of needing an appropriate site investigation to determine the extent of contamination if you progress to the next tier or stage

Find detailed guidance for PRA on the CL:AIRE WALL - see risk assessment - preliminary (INFO-RA1).

The specific information you need will depend on the reasons and objectives for the PRA. You can use the information below as a checklist.

Desk study checklist

From a desk study find out:

- the history of the site
- any pollution incidents, spills, accidents or regulatory actions
- details of any current or past permits, licences or authorisations
- details of any previous investigations or remediation
- any chemical or biological information from for example, previous site monitoring reports
- if available, natural background contamination information, such as radon gas
- if any audit reports have been done
- the location of historical landfill sites
- the presence or proximity of sensitive ecological receptors such as special protection areas
- the location of any protected areas of countryside

- the presence of any archaeological or heritage sites such as scheduled ancient monuments
- information on other specific Part 2A receptors such as crops or property
- any proposed future changes to land use such as planning applications

Find out geological, hydrogeological and hydrological information including:

- made ground, drift deposits, bedrock
- geological features such as faults
- presence of groundwater - unconfined, confined aquifer or a mixture of both
- aquifer type - principal, secondary or unproductive strata
- sensitive groundwater locations such as source protection zones or safeguard zones
- the vulnerability of the groundwater to pollution
- the likelihood of perched groundwater
- abstraction points or wells on or close to site - you must include private water supplies
- presence of and proximity to other controlled waters such as surface water and coastal
- any available water quality information
- information on characteristics such as the likely groundwater flow direction

To find out more about groundwater see the groundwater protection document collection.

Site walkover checklist

From a site walkover record information such as the:

- current use and status of the site - occupied or vacant
- general housekeeping, condition of site and surrounding land use
- presence of visual surface staining and odours
- topography and surface condition - open ground, hardstanding and other geotechnical or surface features
- local surface water features
- ecology
- presence and type of vegetation
- presence and extent of any invasive plant species
- buildings and below or above ground structures such as fuel tanks
- above and likely below ground services
- access and security

Record details of possible S-P-R pollutant linkages and effects, including:

- type, extent, location and behaviour of potential contaminants
- information on site drainage and other man-made potential pollutant pathways
- type of receptor you are dealing with - for example, human health, controlled waters, ecology or property
- characteristics of the people and the environment potentially affected by the contaminants

Use this information, combined with the overall site objectives, to identify S-P-R pollutant linkages and develop your outline CM.

Identify source-pathway-receptor pollutant linkages

Use an S-P-R approach to work out the potential pollutant linkages. Identify the:

- source - a contaminant or pollutant that is in, on or under the land and that has the potential to cause harm or pollution
- pathways - a route by which a receptor is or could be affected by a contaminant

- receptors - 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

The terms source, pollutant and contaminant have the same meaning.
For Part 2A, the definition of contaminant is a substance which is in, on or under the land which has the potential to cause significant:

- harm to a relevant receptor
- pollution of controlled waters

For more details on Part 2A see the contaminated land statutory guidance.
Pathways will be specific to the receptor type. For example, they could be:

- ingestion, inhalation, dermal contact for human health receptors
- infiltration and contaminant migration via permeable strata or the unsaturated zone for groundwater contamination
- gas migration of volatile hydrocarbons into buildings
- direct contact and uptake by plants

A pollutant linkage must be present for there to be a S-P-R relationship. Without a pollutant linkage, there is not a risk - even if a contaminant is present.
You must find out if there are one or more pollutant linkages and how each is related. For example:

- the same contaminant may be linked to 2 or more types of receptor
- different contaminants may affect the same receptor
- a new pollutant linkage may arise by changes over time, such as ongoing migration of contaminants or a change of land use

Conceptual model
Use the information you've collected to create an outline CM. It's a representation of the characteristics of the site and shows the possible relationships between contaminants, pathways and receptors.
You will need to refine your CM as you progress through the further tiers and stages. It will form the basis of your assessment and will help you evaluate the risks correctly.
You can present a CM in different ways, such as a:

- written description of the site
- tabular or matrix description
- drawing or other diagrammatic illustration

You may combine one or more of these formats.
You must show:

- S-P-R pollutant linkages - presence and relationship between contaminants, pathways and receptors
- the subsurface - geology and hydrogeology
- more detailed information as it becomes available such as complex flow regimes and soluble transport mechanisms

You can use the CM to work out and show:

- the characteristics of the site
- what risks may result
- uncertainties and gaps in information and any further assessment needed to address them

As you progress through the risk management process, you will have to refine and update the CM. You can:

- do a site investigation to test and refine the CM
- carry out monitoring to validate the CM
- use detailed geological information such as thickness of made ground, presence of natural and superficial deposits, depth to bedrock, presence of faults
- use detailed hydrogeological information such as hydraulic gradient, flow direction, depth to water table, hydraulic conductivity
- address any uncertainties
- identify potentially different areas (or zones) of a site, based on differing ground conditions, potential contamination and past, present and future uses

Find detailed information on conceptual models on the CL:AIRE WALL - see risk assessment - preliminary (INFO-RA1).

Assess the risks

For a PRA you must assess the risks qualitatively to decide whether particular harm or pollution is unacceptable. You need to base these on the:

- overall site objectives
- qualitative assessment criteria, for example using a risk classification matrix such as the one given in Contaminated land risk assessment - a guide to good practice (C552)
- type of receptor you're dealing with such as human health, controlled waters, ecology or property

You must base your assessment on the potential severity that the risk poses to the receptors against the likelihood of it happening.

See the following examples of qualitative PRA assessments for potential S-P-Rpollutant linkages.

Example 1

Groundwater PRA:

- contaminant - potential hydrocarbons from an old underground tank
- pathway - migration via the unsaturated zone
- receptor - principal aquifer

The decision will be based on the likelihood of hydrocarbons reaching groundwater.

Example 2

Human health PRA:

- contaminant - potential metals in soil
- pathway - inhalation, ingestion, dermal contact
- receptor - future residents

The decision will be based on the likelihood of the metals presenting a risk to human health in a residential setting.

Conclude PRA

At the end of this tier you will need to create a decision record. This must include:

- a summary of the objectives and reasons for doing the PRA
- an outline CM including the basis for how you developed it

- the potential risks - unacceptable or acceptable - and how you evaluated them
- justification for your proposed next steps

You must decide if:

- there's no unacceptable risk and you can exit the process
- more information is needed and you need to proceed to a GQRA or go direct to a DQRA
- there's a clear risk and you need to collect more detailed information and proceed to OA

Your decision may need approval or agreement from the regulator. For example, approval of a Part 2A obligation or to satisfy a planning condition.

Produce a PRA report

See Stage 1: risk assessment reports for what to include.

You may decide to use NQMS.

Tier 2: Generic quantitative risk assessment (GQRA)

If your PRA has identified one or more potential pollutant linkages you can do a GQRA to assess these further.

You will need to:

- establish if you can use GAC and a standard set of generic assumptions to assess the risks
- collect more detailed information to confirm and assess any unacceptable risks

For a GQRA you must:

- review and confirm the overall site objectives
- define the GQRA objectives
- identify appropriate GAC or derive new ones
- work out what information you need to collect
- collect information about the site by doing an appropriate site investigation
- confirm the pollutant linkages that need to be assessed
- decide if GAC are suitable to use
- assess each pollutant linkage using GAC and decide if there are unacceptable risks
- record your findings in your GQRA report and decide what further action is needed

Define the GQRA objectives

You will need to:

- make sure the overall site objectives are still valid
- take into account, build upon and refine the information used in the PRA
- identify any new information as a result of more detailed data collection and assessment

You must consider technical and management factors.

Technical factors include the:

- complexity of the CM and the interaction of ground, groundwater, surface water and gassing regimes
- nature of the S-P-R pollutant linkages
- possible combined or cumulative factors of different contaminants interacting with each other - as you collect more data this may become complex
- potential changes in site circumstances
- uncertainties in any previous information collected

- methods of how you will collect and assess the data to achieve the required level of confidence

Management factors include:

- regulatory requirements such as complying with a planning condition or a Part 2A obligation
- management aspirations - the reasons for the GQRA must be clear, as doing it will involve an increase in cost and time
- constraints on time and budget
- how you will communicate the level of risk to interested parties such as site owners, regulators or members of the public
- being able to reach agreement with stakeholders

You will need to consider:

- the degree of confidence in the outcome of the assessment expected - it must be clear and realistic
- the public's perception - a more complex site and assessment may be more difficult to explain to non-specialists

Identify appropriate GAC

For a GQRA you must assess each potential pollutant linkage by comparing the contaminant concentrations against appropriate GAC.

GAC are screening criteria which are derived using a standard set of generic assumptions. They are designed to be broadly applicable to a wide range of site conditions and exposure scenarios. They must be appropriate and suitable for your site.

GACs:

- relate to concentrations of substances in air, water or soil
- make generic assumptions about the site characteristics, the contaminant, pathway and receptor behaviour
- aim to simplify the RA by using a standard approach
- are used to determine if further RA or more information is required

You may be able to use existing GAC or derive new ones.

When you use GAC you will need to consider:

- if they are appropriate
- how they meet the overall site objectives
- how you will evaluate the risks

You must take into account if the GAC are:

- too conservative - this may result in an unnecessary and more detailed RA or remediation
- not conservative enough - this would result in the assessment of the risk being incorrect

GAC must apply to the:

- type and form of contaminant you're assessing
- relevant media - soil, water, dust, sediments, air and parameters such as soil type, pH
- nature and characteristics of the pathway
- land use - for example, human health criteria are typically more stringent for residential end use than for commercial or public open space
- receptor - including its characteristics, vulnerability or use

If you cannot use existing or derive GAC you will need to do a DQRA or proceed to the options appraisal stage.

Confirm if GAC are suitable

Most GAC are designed to assess risks from specific pollutant linkages. For example, you could be assessing the long term risk to human health from direct contact with heavy metals in soil. In this case, you could use soil guideline values (SGVs).

SGVs are an example of existing GACs you can use. They were derived by the Environment Agency using the CLEA model.

To find out more about SGVs see:

- land contamination: using soil guideline values
- soil guideline values on the CL:AIRE website

Use existing GAC

You will need to identify if existing GAC are suitable to assess each potential pollutant linkage.

Some examples of existing GAC you can use are:

- category 4 soil screening levels (C4SLs)
- soil guideline values (SGVs)
- other suitable values published by industry groups such as LQM / CIEH Suitable 4 use Levels (S4ULs)
- soil screening values for assessing ecological risk
- air quality limits and objectives
- drinking water standards (DWS)
- environmental quality standards (EQS)

You must use caution if a GAC is adapted for a different type of pollutant linkage.

If you use a standard intended for a different purpose this could result in over conservative or under conservative conclusions. For example, you must only use values such as DWS or EQS after you've carefully considered if their inclusion is relevant to your site, the pollutant linkages, and the legislative context.

If you are dealing with ecological receptors you can find detailed information on the CL:AIRE WALL - see assessing risks to ecosystems (INFO-RA2-5).

Derive new GAC

In some cases, you may be able to derive GAC. You will need to use conservative assumptions about the behaviour of the potential S-P-R pollutant linkages.

If you need to derive GAC, you must:

- develop a standard set of generic assumptions that describe the potential linkages appropriately for the GAC
- work out what information you need to collect about the potential linkages and other properties of the site and its setting
- check that the new GAC is consistent with other GAC applied to similar pollutant linkages
- record the information and assumptions you used to derive a new GAC
- set out any requirements for how the new GAC will be applied appropriately

You can consider using some models and formulae that are normally used in a DQRA. These are designed for detailed assessments. They must be used in a quantitative way.

Examples of risk assessment models you can use are:

- the contaminated land exposure assessment model (CLEA) for risks to human health

- RTM spreadsheet model for risks to soil and groundwater
- ConSim for risks to groundwater

When you develop GAC using these models you must:

- have sufficient specialist knowledge and exercise care
- use appropriate and justified information sources for additional parameters such as chemical properties
- keep the assessment generic and understand the limitations at this level of assessment

Find further information on the CL:AIRE WALL on risk assessment to assess the risks to these specific receptors:

- risk assessment - general (INFO-RA2-1)
- assessing risks to human health (INFO-RA2-2)
- assessing risks to the water environment (INFO-RA2-3)
- assessing risks associated with gases and vapours (INFO-RA2-4)
- assessing risks to ecosystems (INFO-RA2-5)
- assessing risks to buildings and services (INFO-RA2-6)

You can find more detailed technical guidance in this British Standard Institute (BSI) document:

- BS EN ISO 15175: Soil quality – characterisation of contaminated soil related to groundwater protection

For ground gas see:

- assessing risks posed by hazardous ground gases to buildings (CIRIA C665)
- BS 8485: Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings

Decide what information you need for GQRA

Having selected existing or derived new GAC, you will need to collect relevant information so that you can use them to assess the risks. You will use this information to:

- confirm which pollutant linkages need to be assessed
- compare the contaminant concentrations from the site investigation against the relevant GAC

The GQRA information you need to collect will build upon the information you gathered from your PRA and will depend on the:

- potential contaminants you're assessing - for example, information for assessing risks from a solvent plume impacting groundwater will be different to information for assessing heavy metals in soils
- complexity of the contamination - for example, if there are mixtures of contaminants from multiple sources
- type of receptor - for example, human health, controlled waters, ecosystems, crops or property will all require different information
- complexity and scale of the site

You may need to collect more detailed information on:

- contaminants - types, lateral and vertical extent, chemical form, concentrations, potential for contaminant leaching and migration, background levels
- ground - type and geology
- parameters you may need to use such as soil organic matter and pH
- any gassing regime prevailing at the site

- receptors - location, types, relationship to site, vulnerability to particular substances, existing condition and history
- pathways - location, type, number and extent
- nature of pathways - such as direct contact, inhalation or migration

Collect more detailed information on hydrogeological and hydrological properties including:

- depth to water table
- thickness of saturated zone
- presence of perched groundwater
- groundwater chemistry
- hydraulic gradient
- groundwater flow direction
- direction and rate of flow of surface water
- seasonal variations in groundwater table and surface waters
- surface water chemistry

You may also need further information on other site conditions such as:

- any remediation already done
- weather and natural patterns - such as seasonal variations in water levels, tidal impacts and potential for or evidence of previous flooding
- presence of structures and buried services

Use this information to refine the CM and confirm the pollutant linkages to improve your understanding of the site.

You must use the correct sampling and analysis procedures. This includes how you preserve and transport samples from site to the laboratory.

You must use the Environment Agency's monitoring certification scheme (MCERTS).

You can find detailed information in these BSI publications:

- BS 10175: Investigation of potentially contaminated sites - code of practice
- BS 5930: Code of practice for ground investigations

For ground gas see:

- BS 8576: Guidance on investigations for ground gas - permanent gases and volatile organic compounds
- BS 8485: Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings

Collect GQRA information

For a GQRA you will need to design and carry out an intrusive site investigation. You may need to phase this for complex sites. You will need an appropriate sampling and analytical strategy to get information on contaminant concentrations. You will compare these against relevant GAC.

You must consider the practicability, costs, effectiveness and benefits of site investigation.

If it is not practicable or cost effective to collect all the information you may have to go back and review the overall site objectives. In some cases, it may be more cost effective to move straight to options appraisal stage, but this will mean that you will need to amend the risk assessment objectives.

The information you collect must be relevant, sufficient, reliable and transparent to support the use of the selected GAC and the type of receptor you are dealing with.

You will need to produce a site investigation report or present the results in your GQRA report.

Confirm pollutant linkages to assess

Use the site investigation information you've collected to confirm which potential S-P-R pollutant linkages you will assess. You may:

- be able to rule out some of the linkages
- need to add some new linkages

You must also check if there are any changes in site circumstances that might affect which linkages need to be assessed.

You must update the CM with your findings and record these decisions.

If you do not have sufficient information to confirm or rule out linkages then you may:

- have to go back and review the overall site objectives
- collect further information

Assess the risks

You must compare the contaminant concentrations from the site investigation against the relevant GAC.

You must consider:

- how rigid the GAC are - for example, if they're advisory screening values or strict limit values
- how much any exceedance matters and how it relates to how you will evaluate the risk - this may need agreement from the regulator
- if concentrations are representative of background conditions
- if the standard set of generic assumptions used are representative of the site
- if there are any uncertainties associated with the GAC
- any additional evidence that has been collected to support interpretation

You must justify how you have evaluated the risks and include this information in your GQRA report.

Conclude GQRA

At the end of this tier you will need to create a decision record. This must include the:

- pollutant linkages you've identified - explain how you developed the CM for example with the site investigation results
- GAC and the assumptions you used to assess the risks
- potential risks - unacceptable or acceptable - and how you evaluated them
- justification for your proposed next steps

Update the CM with confirmed RPLs.

When you've assessed each pollutant linkage, you must decide if:

- the unacceptable risks have been dealt with, no further action is required and you can exit the process
- more information is needed to address uncertainties and complete the GQRA - for example, further assessment, site investigation and monitoring
- there's unacceptable risks and you need to progress to DQRA or proceed direct to OA

If you proceed to OA you may need to collect more detailed information as required by DQRA.

All confirmed pollutant linkages are now called relevant pollutant linkages (RPLs) . You take these to the next tier or stage.

You must update the CM with your findings.
Your decision may need approval or agreement from the relevant regulator. For example, approval of a Part 2A obligation or to satisfy a planning condition.

Produce a GQRA report
You need to produce a:

- GQRA report detailing all your findings and decision record
- site investigation report or present the results in your GQRA report.

You may decide to use the NQMS.

Tier 3: Detailed quantitative risk assessment (DQRA)
You will have identified one or more RPLs that need a detailed assessment.
You can do a DQRA:

- where further assessment is required following a GQRA
- for complex sites where detailed assessment is required

For a DQRA, you will need to collect detailed site-specific information to estimate the risk or to develop site-specific assessment criteria (SSAC).
To complete a DQRA you need to:

- define the DQRA objectives
- decide what information or tools you need to support the RA
- collect the information
- confirm the RPLs that need to be assessed
- assess the risks for each RPL
- decide if there are unacceptable risks
- decide what further action is needed
- record your findings in your DQRA report

You will need to identify or develop tools and criteria to estimate and evaluate the risk. This may include developing detailed SSAC or collecting information about the receptor.

Define the DQRA objectives
You will need to:

- review and confirm that the overall site objectives are still valid
- take into account and build on the information used so far in the RA
- identify any new information as a result of further data collection and assessment

To be able to collect and then assess appropriate information you must define your objectives for DQRA. This may involve refining the objectives from your GQRA if you did one. You need to consider the following technical and management factors.
Technical factors include:

- the complexity of the site, ground conditions and processes - you may need to get a more detailed understanding of particular areas or zones of the site
- RPLs - you may need to get highly specialist information to assess the complexity, toxicity, effects and characteristics of individual linkages
- any combined or cumulative factors - this may require specialist toxicological and environmental fate and transport knowledge
- any potential changes in site circumstances
- the use of risk estimation models - these need specialist knowledge

- any uncertainty of data - such as unexpected monitoring results
- the methods you'll use to assess the data to achieve the required level of confidence

Management factors include:

- regulatory requirements - the DQRA may need to support a regulatory decision
- management aspirations - the reasons for the DQRA must be clear at the outset, as doing it will involve an increase in cost and time
- constraints on time and budget - it may be essential to stage information collection
- timeframe - the DQRA assessment may be more complex
- consultation and agreement with interested parties - because of the complexity of the site more detailed discussion with different interest groups may be required
- communication of risk - transparency is required when the approach used is explained and justified

Other factors include:

- the expected degree of confidence of the assessment - it must be clear and realistic
- public perception - it's a more complex site and the assessment may be more difficult for non-specialists to understand

Decide what information to collect for DQRA

The information you will need for DQRA will depend on the:

- contaminants being assessed
- receptors being considered
- complexity of the site, for example if there are mixtures of contaminants

You will need to collect more detailed information about the:

- RPLs
- site characteristics and surroundings including ground and groundwater conditions
- parameters you will need to use in risk estimation models to derive SSAC

Use the information you collected so far in your RA. If you did not do a GQRAyou must also see the information requirements for a GQRA.

For DQRA, the range of information you need will be broader and more detailed. For example, you may need to:

- expand your site investigation and monitoring to ascertain plume migration
- find out more detailed information on contaminant breakdown products
- get detailed information on hydrogeological properties such as hydraulic conductivity, direction of flow and effective porosity
- collect data to confirm the presence or absence of a pathway
- get site-specific parameters to use in the RA model - such as fraction organic carbon and half-lives for degradation
- collect site-specific information relating directly to the effect of the contaminants on the receptor such as further soil testing, sampling of home grown produce or monitoring of indoor air quality

You may also need additional information on the nature of the contaminant, the soil and water matrix.

The nature of the contaminant includes:

- chemical type for example, organic, inorganic, ionic
- toxicity

- concentration, amount and distribution - laterally and vertically
- solid, liquid or gas
- solubility, volatility, density
- biodegradation potential
- partitioning behaviour of soil, sediment, water, air or biological factors
- contaminant transport properties including evidence of degradation

The nature of the soil and water matrix includes:

- physical form and properties - such as particle size
- lateral and vertical distribution of contaminants
- gas and liquid permeability such as diffusion and preferential pathways
- chemical composition - such as pH, organic matter content, other pollutants, including inhibitors
- physical and chemical stability

Find further information on the CL:AIRE WALL:

- see risk assessment (INFO-RA) to assess the risk to specific receptors

You can find detailed information in these BSI publications:

- BS 10175: Investigation of potentially contaminated sites - code of practice
- BS 5930: Code of practice for ground investigations

For ground gas see:

- BS 8576: Guidance on investigations for ground gas - permanent gases and volatile organic compounds
- BS 8485: Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings

You must use appropriate sampling and analysis procedures. This includes appropriate methods to preserve and transport samples from the site to the laboratory.
You must use MCERTS.

Collect DQRA site investigation information

For a DQRA, you will need to design and carry out an appropriate intrusive site investigation. You may need to phase this for complex sites.
You must consider the practicability, costs, effectiveness and benefits of site investigation.
If it's not practicable or cost effective to collect all the information you may need to go back and review the overall site objectives.
The information you collect must be relevant, sufficient, reliable and transparent.
If you've previously done a site investigation as part of a GQRA then you can build in any additional information to:

- address uncertainty and data gaps - for example, the need for additional samples in a specific area or at a specific depth
- collect additional data to confirm RPLs

You will need to produce a site investigation report or present the results in your DQRA report.

Confirm the RPLs to be assessed

Use the site investigation information you've collected to confirm which RPLsneed to be assessed.
You may:

- be able to rule out some of the potential pollutant linkages from the PRA or RPLs from your GQRA
- need to add some new RPLs

You must also check if there are any changes in site circumstances that might affect which RPLs need to be assessed.

If you conclude that you have insufficient information to confirm or rule out pollutant linkages then you may:

- have to go back and review the overall site objectives
- collect further information

You must update the CM with your findings and record these decisions.

Assess the risks

To assess the risks you can either:

- derive SSAC
- get detailed information about the receptor

Derive SSAC

SSAC are values for concentrations of contaminants derived using risk estimation models such as CLEA or RTM. They're based on detailed site specific information about the characteristics and behaviour of contaminants.

SSACs will correspond to how you will evaluate the risks for the site.

To derive SSACs you will need detailed site-specific information on all of the following:

- characteristics and behaviour of contaminants
- pathways
- receptors

Collect information about the receptor

For DQRA, you do not always need to derive SSAC or use a risk estimation tool.

You may be able to collect additional information to fill in any gaps to confirm an RPL. For example, this might include collecting site-specific information on land use or sampling home-grown produce to decide whether there is an unacceptable risk.

If there is an unacceptable risk then you can use this additional information to develop remediation criteria in tier 1 of OA.

If you are dealing with ecological receptors you can find detailed information on the CL:AIRE WALL - see assessing risks to ecosystems (INFO-RA2-5).

Select a DQRA risk estimate tool

If you select a DQRA tool it must relate to the type of receptor you're dealing with.

We expect that risk assessments for pollution of controlled waters are done in line with the tiered framework set out in the:

- RTM
- land contamination groundwater compliance points: quantitative risk assessments

The models you use for DQRA will need detailed site-specific information as input parameters. You must check the model's sensitivity to any particular assumptions. You will also need to evaluate the uncertainties to ensure that the SSACs are sufficiently precautionary and conservative.

Find further information on the CL:AIRE WALL on risk assessment to assess the risks to these specific receptors:

- risk assessment - general (INFO-RA2-1)
- assessing risks to human health (INFO-RA2-2)
- assessing risks to the water environment (INFO-RA2-3)
- assessing risks associated with gases and vapours (INFO-RA2-4)
- assessing risks to ecosystems (INFO-RA2-5)
- assessing risks to buildings and services (INFO-RA2-6)

You can find more detailed technical guidance in this document.

- BS EN ISO 15175: Soil quality - characterisation of contaminated soil related to groundwater protection

For ground gas see:

- assessing risks posed by hazardous ground gases to buildings (CIRIA C665)
- BS 8485: Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings

You can use some of these DQRA tools to derive SSAC, if it's appropriate to do so.

Decide if there are unacceptable risks

You must consider:

- how much any exceedance matters and how it relates to how you'll evaluate the risk - this may need agreement from the regulator
- if concentrations are representative of background conditions
- if any assumptions used are representative of the site
- any uncertainties within the DQRA
- any additional evidence that has been collected to support interpretation

You must understand the sensitivity of the SSAC. You will also need to evaluate any uncertainties to ensure that the SSACs are as representative as possible for the actual site conditions.
You must justify how you have evaluated the risks and include this information in your DQRA report.

Conclude DQRA

At the end of this tier you will need to create a decision record. This must include the:

- pollutant linkages you've identified - explain how you further developed the CM for example with site investigation results
- criteria, tools and assumptions you used or developed to estimate the risk
- potential risks - unacceptable or acceptable - and how you evaluated them
- justification for your proposed next steps

Update the CM with confirmed RPLs.
You must decide if:

- the unacceptable risks have been dealt with, no further action is required and you can exit the process
- more information is needed to address uncertainties and complete the DQRA - for example, further assessment, site investigation and monitoring
- there's unacceptable risk and you need to move to OA

Your decision may need approval or agreement from the relevant regulator - for example, approval of a Part 2A obligation or to satisfy a planning condition.

Produce a DQRA report

You need to produce a:

- DQRA report detailing all your findings and decision record
- site investigation report or present the results in your DQRA report

You must submit your DQRA risk estimation tool to the regulator if applicable.

You may decide to use the NQMS

Stage 2: Options appraisal

How to do a land contamination options appraisal (OA).

Open allClose all

Your risk assessment (RA) has identified unacceptable risks that you need to manage.

A decision has been made to remediate. Remediation is the action required to prevent, minimise, remedy or mitigate the effects of the unacceptable risks.

You must do an OA to establish an appropriate remediation option or combination of options. A remediation option is a means of reducing or controlling the risks associated with a relevant pollutant linkage (RPL) to an acceptable level.

There are 3 tiers to follow in OA:

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

Decide if sufficient information is available

You must check you've got up to date and sufficient information. This is important if it's a long time since the RA was done or if you did not do a generic or detailed quantitative risk assessment (GQRA or DQRA).

To effectively evaluate and identify remediation options you may need to collect more site investigation data and update the conceptual model (CM).

You may also need general information on:

- what regulatory controls such as permits may be required
- likely noise restrictions - some remediation techniques may need to be controlled
- baseline ambient air quality
- likely weather conditions during remediation - it's important to factor in seasonal variations in water levels and potential for flooding

Tier 1: Identify feasible remediation options

Your aim for this tier is to identify a shortlist of the feasible remediation options you can evaluate in tier 2. They must be able to achieve the remediation criteria you set for the site. You must have considered any site-specific constraints.

For this tier you need to:

- identify OA objectives
- identify a shortlist of feasible remediation options
- select which options are most feasible to assess in tier 2

Identify OA objectives

Before you can select feasible remediation options you must have a clear set of OA objectives in place. These include:

- remediation objectives and criteria
- management and technical objectives

You will already have set your overall site objectives. These could be, for example, to meet specific requirements for remediation such as planning, Part 2A or voluntary.

Set remediation objectives and develop remediation criteria

You'll use remediation objectives and criteria to verify that remediation has worked.

Remediation objectives are site-specific objectives that relate solely to the reduction or control of the risks associated with one or more of the RPLs.

Remediation criteria are site-specific measures against which compliance with remediation objectives will be assessed. They're usually quantitative.

The following are examples of remediation objectives which will control or reduce the risk:

- decrease contaminant mass, concentration, mobility or toxicity
- break RPLs
- effectively contain the contaminant
- manage the receptor or pathway

See the following examples of remediation objectives and criteria.

Example 1

Remediation objective: to ensure that after treatment, soil will not pose an unacceptable risk to human health.

Remediation criteria: no treated material based on set testing frequency, such as one sample per 50 metres cubed, shall contain more than the specific values agreed for residential land use with consumption of home-grown vegetables.

Example 2

Remediation objective: to remediate a groundwater hydrocarbon plume.

Remediation criteria: compliance with agreed DQRA output from the remedial targets methodology (RTM) model to be assessed by a monitoring plan within specific timescales.

Example 3

Remediation objective: to design and install an in ground barrier that protects a receptor.

Remediation criteria: demonstrate performance via permeability testing. For example, testing the slurry materials at pre-defined intervals to demonstrate an agreed hydraulic conductivity.

Example 4

Remediation objective: to ensure an appropriate thickness of a composite surface cover in all affected garden areas.

Remediation criteria: compliance to be measured based on agreed spatial measurements. For example:

- to demonstrate a composite thickness of 1.2 metres per 10 square metres of placed cover in all garden areas

- to comply with local authority requirements where clean cover is validated on a plot basis, such as 1 in every 3 garden plots

Generic assessment criteria (GAC) used in GQRA are sometimes used as remediation criteria. However, this is not what they are intended for. They are quantitative screening values and must be used with caution. You must be able to justify why you have used GAC as remediation criteria. You must consider the hazardous thresholds of contaminants when you determine remediation criteria. This is important because in terms of waste, some GAC values and other assessment criteria, whilst protective of human health are above hazardous waste thresholds for disposal and importation of soils.

Waste characterisation of soils may influence the financial viability of a remediation option.

OA management objectives

Use management objectives to define the required remediation outcome. For example to:

- meet regulatory requirements and produce a remediation strategy (RS) that can be agreed with stakeholders
- avoid unacceptable environmental impacts and health and safety issues and minimise long term liabilities
- avoid the requirement for long term monitoring or maintenance, for example if new housing is planned
- meet timescales and budgets

For any reports you produce you may decide to use the National Quality Mark Scheme (NQMS).

Plan ahead for regulatory controls and approvals

You must plan ahead to find out if any regulatory controls such as permits are required. This is your main management objective for all remediation options.

You must consider in advance:

- if you can use an exemption or regulatory position statement (RPS): Land contamination pilot trials and small scale remediation schemes: RPS 215
- if you need a permit for the treatment or other activity
- if the treatment technology is acceptable for example, will Regulation of trials of new waste management techniques: RPS 182 apply for new or novel techniques
- whether you need a water abstraction licence
- how you will deal with waste
- how long it takes to apply for a permit, deployment or to get approval
- how long the remediation will take - for example, because the land and groundwater remediation deployment form MPP2 is time limited

Find out what regulatory controls and approvals you may need.

If you use innovative methods, you may need to do pilot trials or detailed testing such as laboratory or field-scale trials.

An innovative treatment approach is outside the scope of some environmental permits such as standard rules and RPS 215. You will have to consider RPS 182 and then get a bespoke permit if the Environment Agency find the trial acceptable. This will have time and cost implications.

OA technical objectives

Define the technical objectives of the site. For example, to complete the following within an agreed timescale:

- clear all above-ground buildings and structures
- complete infrastructure such as roads, building footprints, site drainage
- re-grade the site profile in line with specific site drawing
- complete realignment of the river frontage in line with specific site drawing

Other examples of technical objectives could be to:

- improve biodiversity or enhance the amenity value in a particular area of the site by for example, opening up a culverted stream
- use a phased approach in line with an agreed plant shutdown programme
- create a site compound and access route for the duration of remediation
- provide effluent treatment capacity to support remediation to comply with regulatory controls and permits

Select the right technical approach

When you decide which technical approach to use consider using established procedures such as best practical techniques (BPTs) assessments.

If you're dealing with a site under Part 2A you must use BPTs.

There are 3 main ways to reduce or control the unacceptable risks. You can remove or:

- treat the source
- modify the pathway
- modify the behaviour of receptor

Within each of these categories there may be different technical options. For example, it's possible to remove or treat contaminants using a variety of physical, chemical or biological methods.

Remediation techniques can be applied in situ or ex situ. The meaning of these terms are:

- ex situ - removed from the ground before above-ground treatment, encapsulation or disposal on or off-site
- in situ - treated without prior excavation of solid material or water abstraction from the ground

Some approaches to remediation only apply in certain circumstances. For example:

- it's not usually possible to remove a controlled waters receptor - although it may be possible to modify its behaviour or limit its uses
- it may be possible to control an individual's exposure to contaminants by administrative means - such as imposing legal or contractual access restrictions

Identify a shortlist of feasible remediation options

You must identify a shortlist of feasible remediation options for each RPL.

They must be able to reduce or control the risks to an acceptable level.

You need to:

- confirm site characteristics
- consider any factors that might affect the options you select
- select feasible remediation options which will meet your OA objectives
- shortlist the options

Aim for more than one option as you'll need to evaluate these when you do tier 2.

If you cannot create a shortlist, review all the objectives again or if necessary, collect more data or monitor the situation. Then re-establish the remediation objectives for each RPL.

Factors to consider when you select feasible remediation options

Assess the advantages, disadvantages and limitations of the remediation options. Consider the site characteristics, stakeholder views, timescales and wider factors.

Site characteristics and practical factors include:

- site setting - could be densely populated or remote
- practicality - such as site size, for example, smaller sites may have limited capacity for using large-scale plant
- current status - derelict, open, in use or physical constraints such as large numbers of buildings
- how accessible the site is and security arrangements
- site services - such as availability of power and water

Stakeholder views, for example from:

- regulators
- site owner, funder, insurer or insolvency practitioner - such as tolerance of residual risk; flexibility in use of land; views on long term maintenance and monitoring obligations
- neighbouring owners and occupiers - impact on property values, short-term nuisance and disruption

Timescales, in terms of:

- the nature of risk - if there's an immediate risk or only after long term exposure
- any commercial or funding constraints over time
- how long it will take to meet objectives

Wider factors include:

- if the option is durable - can the remediation treatment continue to reduce or control unacceptable risks to a defined level over a period of time
- if it's effective - will the remediation treatment successfully reduce or control unacceptable risks to a defined level
- the environmental impact - will the remediation treatment effect the quality of the environment during or following remediation
- the cost - is it reasonable and affordable, given the available resources
- if the option is sustainable - see for example, the Surf-UK framework for assessing the sustainability of soil and groundwater remediation
- how well it meets other environmental objectives, for example, on the use of energy and other material resources
- any indirect benefits, for example, will it enhance the amenity or ecological value of an area, remove blight or encourage regeneration
- legal, financial and commercial context of the site, including any specific legal requirements the remediation has to comply with

Part 2A requirements

For Part 2A sites, you must refer to section 6 of the contaminated land statutory guidance. This states that decisions must be based on reasonableness and the use of BPT.

The regulator for Part 2A must consider whether the remediation option:

- is practicable, effective and durable - all criteria must be treated equally
- has an impact on health and the environment
- is financially viable
- has benefits
- can meet the aims of the remediation required

Select the most feasible remediation options

You can use the remediation option applicability matrix to select which options are most feasible. The matrix contains information on the potential applicability of a range of common remediation options to particular contaminant-media type combinations.

It covers a range of:

- methods - scientific or technical and commonly available
- media type - presence in soils, made ground or sediments, or in water
- organic and inorganic contaminants

The matrix:

- indicates the broad capabilities of a remediation option
- covers common methods that are generally available
- indicates where a pre-treatment step may be necessary prior to the method being suitable or if case study information on the applicability of the method is inconclusive

You can regularly check the current technical literature to keep up to date.

If you are planning to use them, you may want to consider the list of acceptable treatments given in:

- RPS 215
- standard rules permit: SR2008 No27 - mobile plant for the treatment of soils and contaminated material, substances or products

To work out if an option is feasible you'll need to:

- assess the likelihood of how effective it will be in practice
- consider all site-specific factors
- understand the technical merits and limitations of the option
- check relevant literature regularly to get the most up to date information

You will now have a shortlist of potential options so you can proceed to tier 2 and do a detailed evaluation of the options.

If you have only one option then you will need to go back, review and revisit the remediation objectives.

Following this, if you've still only been able to identify a single feasible remediation option you can proceed to stage 3 remediation.

Find detailed information on the CL:AIRE Water and Land Library (WALL) – see identification of feasible remediation options (INFO-OA1).

Conclude OA tier 1

At the end of this tier you will need to create a decision record. This must include:

- the OA objectives - you need to explain how these were developed and why
- a shortlist of feasible remediation options - you must state how you selected them

Record your decisions in your OA report. See reporting requirements for what to include.

Tier 2: Do a detailed evaluation of options

From tier 1 you'll have a shortlist of potential options. Carry out a detailed review of these options to decide which are most suitable for dealing with each RPL.

You need to:

- assess the limitations, advantages and disadvantages of each option
- establish which options are most suitable - singularly or in combination
- get detailed information on the technical aspects of each option, including the cost
- develop and use OA evaluation criteria to assess the merits of each option
- include proposals for combining options where you've identified more than one option is required

Before you start Tier 2

To properly evaluate your remediation options you'll need to:

- review the information you already have
- collect more detailed technical information

You'll need to check if the remediation method will meet the OA remediation objectives. This means you'll need to know that:

- the method will manage the risks effectively
- you'll be able to verify that the remediation objectives have been met

The cost of the remediation option may influence your decision. To estimate the cost you can use:

- recent or previous experience
- information from remediation contractors
- technical literature

Along with the preparatory, start-up and actual remediation costs you must also consider:

- any uncertainties around the actual ground conditions
- contingency plans for additional costs due to inclement weather such as hire for plant costs and standing time
- the likely commercial climate at the time remediation will start - especially if it's likely that there will be a long time before remediation can start
- costs and time involved with further site investigation and studies

Assess remediation options using OA evaluation criteria

Your evaluation will need to take account of the best practical environmental option.

For Part 2A see the requirements for reasonableness where the criteria for practicality, effectiveness and durability all have equal weighting.

OA evaluation checklist

You can use this checklist to compare or evaluate each remediation option against the other:

- regulatory requirements such as a planning or a Part 2A obligation
- effectiveness in meeting remediation objectives within practical timescales
- applicability to the RPLs
- ease of being able to verify remediation is working or has worked
- stakeholder requirements
- the feasibility of getting and being able to comply with any regulatory permits or controls within the required timescale

- how practical the method is, given the site location, size, access, layout and maintenance needs
- operational needs, such as working space, support services, plant and equipment needs
- compatibility with other site works such as planned infrastructure, ongoing construction or new houses
- availability of the technique
- if different methods can be combined to deal with the site as a whole
- if a single method can deal with multiple RPLs
- track record of method's use
- health and safety requirements
- environmental impacts on or near to the site and in a wider context such as air quality, long term quality of groundwater or the need to use landfill
- sustainability - for example, it meets other environmental objectives
- affordability - given the available resources and likely cost of implementation
- long term monitoring obligations - cost and impracticality or the need to avoid
- durability over time
- if it will provide for a RS that delivers direct and indirect benefits

The level of detail required will depend upon different site circumstances.
You may need to combine options. See OA tier 3 which explains the practicability of combining different treatment options.
Find information on the technical basis of selected remediation methods on the:

- CL:AIRE WALL - see detailed evaluation of remediation options (INFO-OA2)
- EUGRIS web portal which provides information and services on topics related to soil and water
- CIRIA website - see contaminated land guidance tool for references

Conclude OA Tier 2
At the end of tier 2 you will need to create a decision record. This must include how you've:

- assessed which remediation options are the most feasible for each RPL
- decided if any options can or need to be combined

Record your decisions in your OA report. See reporting requirements for what to include.

Tier 3: Select your final remediation options
When selecting your final remediation options, your overall aim for stage 3, is to produce a RS that will deal with the site as a whole.
If you have one remediation option that can deal with one or more RPL, you'll develop the RS based on the characteristics of that option alone.
If you have identified more than one RPL needing multiple remediation options, then you must:

- consider if you can combine options
- identify a different option that will address the site as a whole

For tier 3 you need to:

- consider the practicality of combining options, if applicable
- select your final option

If you have not been able to select feasible options then you must:

- re-assess and go back to previous tiers

- look at alternatives
- decide to do long term monitoring and maintenance as the remediation option

Combining options
You need to consider the practicability of combining different treatment options.

Example 1
Install and operate different remediation options in different parts of the site or at different times. Excavate hotspots of hydrocarbons in soil and biologically treat them using a system of ex situ biopiles. Remove free phase hydrocarbons in groundwater using a dual phase extraction system.

Example 2
Combine options as a single ongoing remediation process.
Excavate and treat contaminated soils followed by on-site segregation and sorting. Further process the resulting segregated soils, such as by on-site stabilisation, on-site encapsulation or off-site treatment.

Address problems with combining options
If it's too difficult to combine options you'll need to:
- go back to OA tier 1 and re-evaluate
- reassess the combined approach that will form the RS
- do a cost-benefit analysis based on revised cost estimates

You may need to use more detailed evaluation criterion to assess the likely effectiveness and limitations of each combined option. For example, return to, use and add to the information on the site and method from tier 1 of OA.
You may need to:
- investigate the site in more detail
- use laboratory or field-scale test data to assess effectiveness under site-specific conditions

Consider how combined remediation options will work in practice
You need to consider in advance how any combined options will work in practice.
You need to consider:
- any efficiency and cost savings you can make
- how the combined options will be co-ordinated
- the number of contractors likely to be involved and who will be responsible for the different work packages or phases
- if there's any flexibility around the timing of the work to maximise the site's capacity, such as mobilisation or demobilisation of plant, provision of storage space, provision or capacity of site services
- if and how combining elements of different remediation options affect technical performance or efficiency - for example, use of extraction wells and pumping protocols to extract contaminants that have different distributions and physical properties
- how to contain working areas to minimise re-contamination of completed work, especially where work is zoned or time phased
- how you will comply with the Construction (Design and Management) Regulations (CDM)

To manage ancillary works to achieve efficiency and cost savings, consider for the different work packages or phases:

- how you will handle residues, such as storing, treating or disposal capacity of solid and liquid waste
- what monitoring you need to carry out for compliance, such as ambient air quality monitoring, monitoring of discharges to sewer
- what verification you need and how you'll achieve it throughout remediation

Select final options

You need to base your final selection on:

- meeting the OA remediation objectives and any site-specific constraints
- your OA evaluation results
- costs
- technical merits

Aim to select one clear option for one or more RPL. For example, you may have to choose between a:

- well-established technique with a proven track record for addressing the risks over a particular time period
- cheaper less established technique that will require long term monitoring

Example of a decision:

Method A is a well-established technique that's used routinely and offers a good long term solution. Remediation can easily be completed within the required timescale. The estimated cost is £1 million.

Method B is less established but does have a track record of successful use in similar applications. A reasonable number of specialist contractors can offer it. Method B is likely to pose fewer short-term health and safety and environmental risks compared to method A. However, it's more uncertain that method B will meet remediation objectives within the required timescale and it's likely that some post-remediation monitoring will be needed. The estimated cost of method B is £500,000.

In this example, method B was selected as the most appropriate option. This was because the difference between the 2 methods on technical grounds was not significant. Method B offered potential cost savings, some of which can be used for the required monitoring to verify that the remediation objectives have been met.

If you cannot identify feasible remediation options

It may be difficult to identify a remediation option that meets some or all of the remediation objectives completely.

For example, the remediation option:

- cannot provide certainty on reducing or controlling the risks
- cannot be achieved within the required timescale
- is not practical, such as for the site size, location, access or topography
- is too expensive even if it's the most effective, practicable and durable solution

It might be that you have identified that the unacceptable risks cannot be dealt with by a technical or engineering solution.

Stakeholders may have different views on what is needed, for example:

- the regulator, to meet regulatory and legal requirements - this is likely to be your most important consideration
- the site owner on what they consider sufficient for redevelopment
- neighbouring property owners

You may need to go back to OA tier 1 and review the OA remediation objectives. Or you may be able to:

- agree a lower standard of remediation, such as by changing the layout or use of the site
- make adjustments in other areas, such as providing additional health and safety protection
- look at alternative remediation options such as new technology or approaches as set out in RPS 182 - you'll need to discuss this with the Environment Agency
- carry out long term monitoring and then re-evaluate, particularly if the site has complex contamination

Decide to do long term monitoring as a remediation option

Sometimes the only feasible remediation option is to implement a long term monitoring programme. For example, due to the contaminants location it may be impractical to carry out remediation effectively.

You can use long term monitoring to track changes in how the contaminants behave or move.

You'll need to:

- set monitoring objectives, methods and criteria
- provide details of what monitoring and maintenance is required - include how you decided to select this as the remediation option
- do stage 3 tier 3: long term monitoring and maintenance
- update the CM

Where remediation includes the construction of permanent structures, these may need long term maintenance to ensure they continue to work.

Monitored natural attenuation

For groundwater contamination, for certain readily degradable pollutants, natural processes of degradation and attenuation may be suitable for managing the RPL. It will need to be achieved within an acceptable time period.

You'll need to do comprehensive long term field monitoring and modelling to support this decision. This remediation option is known as monitored natural attenuation (MNA).

You may need to get agreement or approval from the Environment Agency to do long term monitoring and maintenance or MNA as a remediation option.

Find detailed guidance on the assessment and monitoring of natural attenuation of contaminants in groundwater on the CL:AIRE WALL – see identification of feasible remediation options (INFO-OA1).

Conclude OA Tier 3

At the end of tier 3 you will need to create a decision record. This must include how you've:

- assessed how combined options can work in practice
- selected the final remediation option - explain why you selected it and why you rejected the others

- decided what action to take if feasible options could not be identified
- decided whether to do long term monitoring and maintenance

Record and justify your decisions in your OA report. See reporting requirements for what to include

Stage 3: Remediation

How to develop a remediation strategy, implement it and verify remediation has worked.

Open allClose all

From your options appraisal (OA) you'll have identified the most feasible remediation option or combined option to mitigate the risks associated with the relevant pollutant linkages (RPLs).

There are 3 tiers for stage 3:

1. Develop a remediation strategy (RS).
2. Remediation and verification.
3. Long term monitoring and maintenance, if required.

You now need to:

- develop and agree a RS which you can implement and verify in practice
- get any necessary regulatory controls and approvals before you start remediation
- verify remediation has worked
- do long term monitoring and maintenance, if this was decided at the OA stage

You must make sure that:

- unacceptable risks have been satisfactorily mitigated
- the remedial works do not cause harm to human health or the environment
- there is an accurate final record of the land quality

Before you start

Confirm the site information is still valid.

You must base the RS on the latest site information and documentation.

This is important if it's a long time since any monitoring, risk assessment or OAwas done.

Review the information for the site and confirm the:

- overall site objectives are still the same
- existing physical and chemical conditions of the site are as recorded
- volume of contaminated material is still correct
- effectiveness of the remediation technologies are still valid and available
- remediation work can be completed in the time available and within budget

You may need to:

- consider more site investigation, testing and monitoring
- go back to previous tiers and stages
- do treatability studies or detailed quantitative risk assessment predictive modelling

Update the conceptual model (CM) where necessary.

Plan ahead for remediation

Before you develop the RS, you can identify, prioritise or start preparatory work such as:

- establish a site compound
- do baseline monitoring, such as noise, ambient air or water quality
- provide access for plant, vehicles and materials to site - you must not mobilise treatment plant to site unless you have a relevant permit or deployment in place

- decommission and demolish existing buildings or structures
- construct temporary infrastructure, such as haulage roads or hardstanding
- re-route underground or above ground services

Tier 1: Develop a RS

For tier 1 you need to develop and produce a single RS that will deal with the site as a whole. The RS must include a clear set of remediation activities for your site and how you will implement and verify them. It's a record of how you will meet and carry out the remediation objectives.

The RS must:

- clearly set out how the selected remediation options will mitigate the risks from the RPLs and meet OA objectives
- meet any regulatory requirements - such as to fulfil a planning condition, a Part 2A obligation or to comply with permit conditions
- state how human health, the environment and ecology will be protected
- be practical, effective and durable
- be compatible with other aspects of work such as redevelopment
- be achievable, sustainable and able to deal with uncertainty
- be verifiable by testing, measuring, monitoring or other recording methods
- consider potential nuisance and disruption to local residents

Produce a RS

A suitably qualified person with training, knowledge and experience in remediation must produce the RS.

You may need to consult with:

- the client
- regulatory authorities
- a quantity surveyor
- legal advisers
- the contract laboratory
- landfill or waste treatment operators
- a civil engineering consultant
- a project management consultant

You must agree the RS with relevant stakeholders.

For any reports you produce you can decide to use the National Quality Mark Scheme (NQMS.

What to include in the RS

Your RS must include:

- monitoring objectives and criteria
- the remedial actions that will be done
- details of how you will implement remediation
- details of how you will verify remediation is working
- details of monitoring and maintenance
- details of any regulatory controls that need to be in place, such as permits and deployments

It must also set out:

- the technical and scientific basis for the choice of remediation technology

- the effectiveness of any combined options
- any constraints and limitations of the selected remediation options
- the timescales for remediation options to become fully effective
- the expected durability of the proposed remediation
- how you'll prevent pollution being caused by the remediation activities
- how you'll deal with uncertainties and contingency planning - for example, what you'll do if you find unexpected contamination
- justification for any changes required to previously derived remediation criteria
- a summary of alternative strategies considered
- a description of how the RS will deliver remediation objectives and criteria

See also the RS reporting requirements for what to include.
You must state within the RS if no tier 3 long term monitoring or maintenance is required. You'll have to decide this at the OA stage.
You must confirm that the RS will deal effectively with all of the RPLs identified in the CM.
Find detailed information on the CL:AIRE Water and Land Library (WALL) - see developing the remediation strategy (INFO-OA3).

Set monitoring objectives and criteria
Your RS must include monitoring objectives and criteria.
Monitoring objectives are site-specific - they define the monitoring programme that's needed.
They're used to:

- track contaminant behaviour and movement, to give an early warning of adverse trends
- demonstrate the ongoing, short and long term performance of the remediation

Examples of monitoring objectives are to:

- find out if a contaminant plume is spreading or shrinking
- verify remediation is working or has worked
- clarify any uncertainties

You must use monitoring criteria. These are measures, usually quantitative, against which compliance with monitoring objectives will be assessed. Examples of criteria are:

- derived remedial targets
- remediation evaluation criteria
- environmental quality standards

Provide details of how you will implement remediation
You must include in your RS details of how you'll implement remediation, including:

- information on regulatory approvals such as permits you will need before you start remediation
- the timescales involved in being able to apply for regulatory approvals and meet the requirements

You'll need to procure a standard form of contract for remediation.
You must have confidence in the personnel you appoint - they will need to have a proven track record and the required expertise. You must define who is responsible for doing what, including the site supervision before and during works.
See RS reporting requirements for what to include.

Find detailed information on implementing the RS on the CL:AIRE WALL - see implementation of the remediation strategy (INFO-IMP).

Provide details of how you will verify remediation

Your RS must:

- provide details of how you will verify remediation is working
- state how you will collect and assess data to demonstrate it'll meet the remediation objectives and criteria

It must include sampling and testing criteria. You can use a lines of evidence approach.

You must consider any likely verification requirements such as:

- reporting procedures and regulatory requirements, such as approvals
- how you will keep and maintain records to demonstrate compliance
- how you will meet quality standards such as the Environment Agency's monitoring certification scheme (MCERTS) from data collected on site or produced by laboratories
- whether you need additional equipment or to construct monitoring wells

See the RS reporting requirements for what to include.

Use a lines of evidence approach

To verify remediation is working you can use a lines of evidence approach.

You can use it to demonstrate the performance of remediation by collecting data sets for principal parameters.

Include in your RS how you will collect the data for the lines of evidence and how you will verify the performance of each.

Example lines of evidence include:

- soil sample tests, such as at defined locations, at set time intervals, per volume of soil excavated, moved or treated
- post treatment tests of water quality samples
- measuring the rates of reaction, product breakdown, degradation measurements
- measuring quantities of contaminants or contaminated media removed
- measuring parameters, such as pH, dissolved oxygen, flow rates
- regular monitoring of contaminant concentrations and geochemical properties in groundwater to show the effectiveness of active treatments or natural attenuation
- representative measurement of physical properties, for example permeability, strength, thickness and level of clay cap or stabilising materials
- compliance tests of stabilised materials
- testing of quality of imported soils or other materials
- measuring the thickness of a capping layer after placement by topographical surveys before and after placement
- visual inspection of gas-resistant membranes for evidence of tears or gaps around service entries
- evidence of conformance to regulatory controls such as permit conditions, abstraction licence volume limits
- results of dust, noise, odour and other monitoring at site boundaries and other agreed locations
- testing of water quality in nearby watercourses or groundwater bodies

Find detailed information on verification on the CL:AIRE WALL - see implementation, verification and monitoring (INFO-IMP2).

Monitoring and maintenance

In some cases you'll need to provide details of monitoring and maintenance. For example, when you need to:

- demonstrate that remediation has and is continuing to work
- do site maintenance for a specified period to meet remediation objectives
- demonstrate that the works have not impacted air or water quality
- do tier 3 long term monitoring and maintenance

The RS must provide details on the extent, scope and duration of the monitoring and maintenance.
Monitoring reports may be required at appropriate intervals to verify the ongoing remediation. You must provide details of what these intervals are.
You must use MCERTS for the chemical analysis.
See the RS reporting requirements for what you can include in your monitoring and maintenance section of your RS.
You must justify and confirm within the RS if monitoring and maintenance is not required.
Find detailed information on the CL:AIRE WALL - see long term monitoring and maintenance (INFO-IMP3).

Detailed design

Check if any initial designs were started at the OA stage. For example, there may have been some work to establish the feasibility of a particular treatment, such as planning for a permeable reactive barrier.
Use any initial design work to prepare detailed design drawings, specifications and contract documents.
The specification describes the work that is needed and the quality standards you will achieve.
Make sure the design meets the remediation requirements. For example, your design must not:

- hold up remediation
- cross contaminate
- cause new pathways such as from piled foundations causing vertical pathways

Complete the detailed design and include it in your RS.

Consider local residents

You'll need to consider concerns from local residents, including:

- how the remediation works will affect adjoining land and neighbouring properties
- the number of working hours and days per week
- how long the works will last
- noise, dust and odour nuisance and how this will be managed
- lorry movements, potential road works, closures, traffic restrictions on roads or footpaths
- the likelihood of the remediation being successful or if further works are required

Keep the owner or client informed of any of these issues.

Construction design and management (CDM) requirements

You must ensure design and remediation works meet CDM health and safety requirements. Find more information on CDM on the Health and Safety Executive website.
You may also have to meet other health and safety needs, for example:

- building regulations requirements
- control of substances hazardous to health assessments

Consult and agree the RS
You must:

- put the RS into place in an effective and orderly way that will achieve the remediation objectives
- communicate and consult with relevant parties on integral parts of the RS

You'll need to consult on the final RS. For example, with:

- professional teams working on other aspects of the project, such as a quantity surveyor
- legal team for contracts, liabilities and warranties
- the regulator and other organisations such as Natural England and English Heritage
- statutory undertakers for certain developments and highways works
- prospective purchasers, insurers and funders
- local residents, neighbouring properties and local interest groups, such as community or wildlife groups

Find detailed project management information on the CL:AIRE WALL, see:

- guidance specific to particular industrial or commercial sectors (INFO-PM1)
- health and safety and quality management (INFO-PM2)
- communication (INFO-PM3)

Conclude remediation Tier 1
At the end of this tier you will need to create a decision record. This must include how:

- you've developed, produced and agreed the RS
- the RS meets the remediation objectives
- the RS will meet the requirements for the site as a whole
- the remediation can be implemented in a timely, safe, cost-effective and quality assured way
- the remediation can be verified

Issue the final RS once agreed, to all relevant parties.
The RS is part of the final record of the land quality.

Tier 2 Remediation and verification
Having produced and agreed the RS you can now:

- apply for any permits and other regulatory controls
- carry out the remediation
- verify that the remediation is being effective and if it's not, do further work
- produce a verification report to show that remediation has been successful
- create a final record of the land quality

Apply for regulatory controls and permits
You must not start remediation until you have all the relevant regulatory approvals in place.

The RS will have identified which regulatory controls you need.
Allow sufficient time when you apply.
Most land contamination treatment activities will use:

- standard rules: SR2010_No 27: Mobile plant for the treatment of waste soils and contaminated material, substances or products and deployment form MPP2
- a bespoke mobile plant permit for the treatment of waste soils and contaminated material, substances or products
- a site based permit

For small scale trials or remediation schemes, your activity may meet the conditions in land contamination pilot trials and small scale remediation schemes: RPS 215.
The 2 waste exemptions most applicable to land remediation activities are:

- U1 use of waste in construction
- T5 screening and blending waste

An exemption or exclusion is available for a specified groundwater remediation scheme. This involves the introduction of substances to groundwater to enhance the rate of remediation of contaminants. See tracer tests and remediation schemes: environmental permit exemption.
You must allow for some of your activities being time limited, for example, an approved deployment is usually limited to 12 months.
You must apply for an abstraction licence if you want to abstract 20 or more cubic metres of contaminated groundwater per day.
Also find out if:

- you need a surface water discharge or groundwater activity permit
- a groundwater activity exclusion applies
- you need a consent to discharge trade effluent to foul sewer from the local sewerage undertaker

Get any other regulatory approvals you need before work starts, for example:

- agreement of the RS from regulators
- planning permission
- for Part 2A - liaise with regulators to make sure you meet the requirements

If you intend to use the CL:AIRE Definition of waste: development industry code of practice (DoW CoP) you can find further details on the CL:AIRE WALL.
See also the position statement J8 on the DoW CoP in the Environment Agency's approach to groundwater protection.
You can start remediation:

- once any necessary regulatory controls are in place
- you have agreement from stakeholders

During remediation
You must:

- react to testing results or monitoring data promptly
- allow time to get and interpret the data without delaying progress
- use a different solution or contingency measure if the data shows that the remediation is not working

You must regularly provide remediation progress reports.

Produce a verification report

Verification demonstrates that the risk has been reduced and the remediation objectives and criteria have been met. It will be based on a quantitative assessment of the remediation performance.

You must produce a verification report. It:

- provides a complete record of all remediation activities
- is part of the final record of the land quality
- must show that remediation objectives and criteria have been met

You must normally produce the verification report once the remediation work is complete. If remediation is phased you may need to produce separate verification reports for each phase.

You must use MCERTS when you provide evidence of verification.

See verification reporting requirements for what to include.

Find detailed information on verification on the CL:AIRE WALL - see implementation, verification and monitoring (INFO-IMP2).

Where tier 3 long term monitoring and maintenance is required, the verification report is a snapshot in time. You will need to produce a separate long term monitoring and maintenance report to complement the verification report.

Conclude remediation tier 2

At the end of this tier you will need to create a decision record. This must include:

- details of any necessary regulatory controls that were required
- a verification report to show that remediation is acceptable

If you decided:

- to do long term monitoring and maintenance proceed to tier 3
- not to do long term monitoring and maintenance you can conclude stage 3

Conclude stage 3

At the end of this stage you must decide if:

- remediation has been successful and has met the remediation objectives and criteria
- there's a need to re-evaluate, if remediation has not been successful
- there's a need for further monitoring and maintenance work

Your decision that remediation is acceptable may need approval or agreement from the relevant regulator. For example, approval of a Part 2A obligation or to satisfy a planning condition.

Create a final record of the land quality

When remediation is complete you'll need to create a final record of the land quality. The landowner and any other relevant parties must hold copies of the:

- RS
- verification report
- long term monitoring and maintenance reports, if applicable
- health and safety information
- contract documents, as built drawings and specifications

For Part 2A, recording these details is a statutory requirement.

Tier 3: Long term monitoring and maintenance

This tier applies if:

- long term monitoring and maintenance was agreed as a remediation option in the OA stage
- you need to do post-remediation monitoring and maintenance for further verification

You will have set your monitoring objectives and criteria in your RS.
For this tier you need to:

- identify what is required
- decide who will carry out the work
- report your results
- decide when monitoring or maintenance can stop and remediation is complete

You'll need to consider the frequency, scope and reporting requirements of the monitoring. You must ensure that:

- this is acceptable with regulators and stakeholders
- there are plans in place if monitoring criteria are not met
- access to carry out the work is still acceptable - for example, redevelopment may have changed access to plant or monitoring points
- any specialist skills for ongoing maintenance are in place if it cannot be done routinely
- there are adequate provisions for replacing consumables such as treatment chemicals
- the power supplies are guaranteed and whether emergency back-up is required
- any maintenance work items are fully specified, including actions, frequency, responsibility and standard you will achieve
- there are reactive maintenance measures in place to deal with unexpected events such as emergencies, breakdowns, vandalism or accidents

See long term monitoring and maintenance reporting requirements for what to include.
After you determine the details you need to:

- get suitable personnel to do the monitoring and maintenance
- ensure that the work is carried out and reported on as agreed
- ensure that reactive maintenance measures are done
- regularly review and revise if monitoring criteria are not met or if there are unexpected results
- give copies of all reports to the stakeholders

If monitoring criteria are not met

If you cannot meet monitoring criteria you can:

- check equipment and calculations are correct to verify the monitoring data
- consider the effect of seasonal variations
- consider any spatial variation in monitoring data - you could add extra monitoring points
- increase the frequency of monitoring locally or across the whole site
- consider introducing continuous monitoring or an alarm system
- modify the remediation to improve effectiveness

You must record these contingency plans and any actions done in your long term monitoring and maintenance report.
Find detailed information on the CL:AIRE WALL - see implementation, verification and monitoring (INFO-IMP2).

Create a decision record

At the end of this tier you must create a decision record that states whether you:

- have met long term monitoring and maintenance objectives
- have agreement that remediation is complete
- need to do further monitoring and maintenance work

Your decision may need approval or agreement from the relevant regulator.
You must issue final reports which prove monitoring objectives and criteria have been met to stakeholders. For example, to the landowner and the regulator.
You can now create a final record of the land quality to conclude stage 3.

Site investigation
How to plan for a site investigation.
You may need to plan, design and carry out an appropriate intrusive site investigation.
You must record your findings in your site investigation report.

Intrusive site investigation
For a site investigation, you will collect and analyse soil, surface water, groundwater, soil gas and other media. To do this you will need to excavate trial pits, drill exploratory boreholes and construct groundwater monitoring wells.
Use the information you collect and the results to refine the conceptual model, the risk assessment, options appraisal and remediation stages.
You may do a site investigation in a single or a number of phased stages. It may be simple or detailed, depending on the complexity of your site.
The information you collect must be representative of all relevant aspects of the site. It must be:

- from the right locations
- at appropriate time periods

Your data collection procedures must meet quality management standards. When you present data, its origin and meaning must be transparent.
You must use the Environment Agency's monitoring certification scheme (MCERTS).
Find detailed information in these information sources for site characterisation on the CL:AIRE Water and Land Library (WALL) - see:

- general (INFO-SC1)
- sampling design (INFO-SC2)
- field and laboratory analysis (INFO-SC3)

You can find further detailed information in these British Standard Institute (BSI) publications:

- BS 10175: Investigation of potentially contaminated sites – code of practice
- BS 5930: Code of practice for ground investigations
- BS EN ISO 16133: Soil quality - guidance on the establishment and maintenance of monitoring programmes

You can use this guidance for the number of monitoring points required, duration of monitoring programme and information on gas risk assessment:

- assessing risks posed by hazardous ground gases to buildings (CIRIA C665)

Consider practicability, cost, effectiveness and benefits
When you collect site information you will need to consider the practicability, cost, effectiveness and benefits.

Practicability factors include:

- on-site or off-site access
- timeframe and phasing requirements
- regulatory, health and safety and other management requirements
- identifying site services and making sure you can avoid them during intrusive investigation
- weather conditions

When you consider the cost of site investigation you must take into account:

- the total cost against available budget
- whether you can justify it against the level of risk present
- potential delays while information is collected
- that better quality information could reduce costs
- that poor quality information could increase costs

Doing a site investigation needs to be effective and of benefit. You need to consider if:

- the information you collect will be useful and relevant
- the extent of information will match the requirements for certainty in decision making
- there are any advantages or disadvantages of using additional or alternative methods, such as non-intrusive geophysical surveys
- there are any implications of making wrong decisions in the absence of information - for example, failure to establish particular areas of contamination

Check the quality of the site investigation information

The information you collect must be relevant, sufficient, reliable and transparent.

Relevant

It must match the site's parameters, particularly the:

- contaminant type
- characteristics of pathways and receptors
- soil type

Sufficient

It's important that:

- the appropriate number of samples have been taken for measuring against the assessment criteria
- groundwater flow direction and the number of groundwater samples needed to characterise the groundwater regime at the site have been considered
- sample points have been located and spaced so they're sufficient to define zones

Reliable

It must reflect true or likely conditions. You must use MCERTS.

Transparent

It's important that:

- the information you collect is unambiguous
- any uncertainty is recorded and dealt with
- the origin of the information is clear

Find detailed information for sampling quality of soil and groundwater in the:

- guidance on the design and installation of groundwater monitoring points

You can find further detailed information in these BSI publications:

- BS ISO 18400: Soil quality sampling series
- BS ISO 5667-11: Water Quality, Sampling, Guidance on sampling of groundwaters
- BS ISO 5667-22: Water Quality, Sampling, Guidance on the design and installation of groundwater monitoring points

Monitoring certification scheme (MCERTS)

MCERTS is the Environment Agency's monitoring certification scheme. It provides a framework to meet our quality requirements.

You must use MCERTS. We will only accept laboratory data from methods that have been accredited to the MCERTSstandard.

When you submit chemical test data on potentially contaminated soils and water to the Environment Agency you must:

- ensure that chemical analysis results submitted conform to MCERTS requirements
- check that the laboratory carrying out the analysis has MCERTS accreditation for all parameters requested
- work with the laboratory to make sure there are complete audit trails of samples and that these are available

Contact us for advice if you cannot find a suitable laboratory.

To find out more about MCERTS see monitoring emissions to air, land and water (MCERTS).

For soil see the brief guide for procurers of analytical services: MCERTS: performance standard for laboratories undertaking chemical testing of soil.

This performance standard does not directly cover sampling. You must ensure that sampling procedures, preservation and transportation are appropriate.

You can find further detailed information in BS 10175: Investigation of potentially contaminated sites - code of practice

The regulatory decisions we make are based on the data you submit.

Using MCERTS will provide confidence that your results are acceptable and reliable.

Reporting requirements

The reports you must produce and the information they can include.

Open allClose all

Suitably qualified professionals must produce land contamination reports.

You must record and report the decisions made. Your reports must include both factual and interpretative information. Keep factual and interpretive information separate.

You can produce a single report for each stage of the risk management process as long as it contains the correct information and follows the requirements of this guide.

For large, complex sites, or if you're phasing remediation works or site investigations, you may need to produce individual reports for each tier or phase.

You can use these checklists to find out what reports you need to produce and what type of information to include.