Phase 2: Intrusive Ground Investigations and Quantitative Risk Assessment

Contents

1.0 Introduction

1.1 A Phase 2 assessment consists of an intrusive site investigation with quantitative risk assessment. Depending on the outcome of this assessment a subsequent remediation strategy and verification report will then also be required. A Phase 2 assessment is only required if the need for one has been identified in the initial Land Contamination Assessment or to accord with any conditions the Local Planning Authority have attached to the planning approval.

1.2 The Phase 2 report should be submitted to and approved in writing by the LPA and implemented prior to development commencing. However although it is the final document and implementation of any required remediation works that are likely to be required to fully discharge relevant conditions, a phased approach is recommended.

2.0 Phase II - Intrusive Investigations /Quantitative Risk Assessment

2.1 Carrying out intrusive site investigations is the first part of the next stage and is fundamental to the Phase 2 investigation as it seeks to confirm potential source-pathway-receptor pollutant linkages at the site to allow refinement of the preliminary conceptual site model submitted as part of the Phase I assessment. The data obtained will be used to inform a decision as to whether the site is potentially harmful and will indicate whether any remedial works are required to mitigate any risks from contamination that may be present.

2.2 The site investigation can be undertaken in phases in order that resources can be targeted at the areas that are most likely to be contaminated. The separate phases may be submitted individually as separate reports or as one combined report i.e. Preliminary Risk Assessment or Preliminary and Quantitative Risk Assessment followed by option appraisal and implementation/post remediation verification report.

2.3 The site investigation procedure involves specialist technical knowledge and it is essential that competent and experienced personnel who should preferably

hold recognized and appropriate qualifications conduct all phases of the site investigation procedure. Where a geotechnical study and a contamination study are combined within one report the consultant should be able to demonstrate that he is competent and has expertise to provide advice on both.

2.4 Investigation should be carried out in accordance with CLR11 and British Standard '*BS10175:2001 Investigation of potentially contaminated sites – Code of practice*' (see References). It is also advisable that prior to carrying out any ground investigations the methodology has been approved by the Local Planning Authority.

2.5 It is essential that developers base their site investigations in accordance with current good practice. Reports that do not use a proper scientific or appropriate sampling strategy to assess risks from land contamination will be rejected by the Council.

2.6 Examples of current good practice can be found in the following documents:

- BS 10175:2001 British Standard Institute (2001) Investigation of Potentially Contaminated Sites - Code of Practice, British Standard Institute. London.
- Environment Agency (2004) Contaminated Land Report 11; Model Procedures for the Management of Land Contamination
- Environment Agency (2000) Technical Aspects of Site Investigation (2 Vols.). Research and Development Technical Report P5-06517R. Water Research Centre, Swindon
- Environment Agency (2000) Guidance for the Safe Development of Housing on Land Affected by Contamination. The Stationary Office. London
- Environment Agency (2001) Secondary Model Procedure for the Development of Appropriate Soil Sampling Strategies for Land Contamination. R&D Technical Report PS-066/7R. Water Research Centre, Swindon

2.7 All sampling strategies should be designed to provide data that is representative of the site conditions as a whole. Sampling should be

undertaken in accordance with recognised sample collection methodology and guidance. Reference to the historical site information obtained from the desk study is essential in order to target possible sources of contamination and to ensure that appropriate analysis is performed. Underground structures such as fuel tanks, pipework and foundations will also need to be identified. Off site sampling may also be required in order to assess whether migration of contamination is occurring away from the site.

2.8 A suitably accredited laboratory should be used to undertake analysis of samples. Where available, chemical analysis of samples must be by methods accredited to the Environment Agency's MCERTS (Monitoring Certification Scheme) standard.

2.9 Following completion of the investigation, analysis results need to be compared against suitable assessment criteria. Gateshead Council will not accept any contaminated land risk assessments derived using the withdrawn CLEA framework or based upon old SGV's. The new CLEA software and associated handbook can be used by practitioners to derive and generate their own generic or site specific criteria that comply with the revised and updated approach. Practitioners may also wish to utilise other risk assessment models, provided the updated guidance and framework are followed. Generic Assessment Criteria (GAC) produced by private sector organisations such as WS Atkins (SSV's) and Land Quality Management/Chartered Institute Environmental Health may also be acceptable provided the revised approach has been used in their derivation and is fully justified and conforms to current UK policy.

2.10 However, not all contaminants may be covered by the above generic guidelines and some generic guidelines may not always be appropriate for assessing potential risks to human health and the wider environment in the United Kingdom. Some allowance may have to be made to reflect assumptions that were made when the guideline values were derived in order to make them more appropriate for UK conditions. It may also be necessary to conduct a detailed quantitative risk assessment (DQRA) and generate appropriate Site-Specific Assessment Criteria if no appropriate generic guidelines have been found.

2.11 The Environment Agency's '*Remedial Targets Methodology – Hydrogeological Risk Assessment for Land Contamination*' guidance should be used for assessing contamination risks to ground and surface waters (see References). The first step of this particular assessment is to compare water and leachate samples to the appropriate environmental water quality standards.

2.12 Where ground gas issues have been identified on a site, ground gas investigations and risk assessment will need to be carried out, preferably in accordance with guidance documents published by BSI, CIRIA, CIEH and NHBC/RSK (see References).

2.13 Following completion of the investigation, a report detailing the investigation methodologies used, results, conclusions and recommendations should be submitted to the local authority for approval. The report should include:

- Rationalisation for sampling locations including reference to desk study findings;
- Sampling techniques used;
- Plans of sampling locations;
- Borehole and trial pit logs;
- Groundwater and ground gas monitoring where applicable;
- Copies of laboratory analysis certificates;
- Discussion of ground, groundwater and gas conditions and any contamination encountered;
- Qualitative and quantitative risk assessments including comparison of analytical results with appropriate assessment criteria;
- Refinement of the conceptual model and preliminary risk assessment;
- Discussion of any uncertainties in relation to the conclusions; and
- Recommendations for further investigation (if required) and remediation.

2.14 If the assessment shows that there are unacceptable risks from contamination to human health, property or the wider environment, then remediation will be required. The development should not commence until the follow up remediation works have been identified and carried out. Details of the remedial works should also be submitted to the LPA before being carried out.

See Appendix A1 for more information on site investigations and quantitative risk assessments

3.0 Remediation Strategy

3.1 The remediation phase of the process should be split into two sections. The Option Appraisal should identify and evaluate options, develop a remediation strategy, and include health and safety issues. The 'Remediation Strategy' is a document detailing the objectives, methodology and procedures of the proposed remediation works. This must be submitted to the Council, for approval, before any remediation works commence.

3.2 The report should include details on how the remedial works will be validated to ensure that the remedial objectives have been met. If remediation of controlled waters is necessary, the Environment Agency will need to approve the proposed works.

3.3 As part of the production of the remediation strategy, an options appraisal of feasible remediation options should be performed. Some remedial works may require applications for environmental permits, licenses or consents, especially those involving waste management activities. All such agreements will need to be in place before site works commence. The Environment Agency should be consulted where works involve mobile plant or have waste management issues.

3.4 Where remediation requires importation of soil on to the site for use in garden or soft landscaped areas, this material must be 'clean' and suitable for use. Appropriate validation documentation will need to be submitted to the local authority to confirm that imported material is suitable for use. In certain circumstances, material reclaimed from the site for reuse in garden or soft

landscaped areas may also require validation before placement in these areas.

3.5 There should be a minimum of 1.15m thick proven clean covering layer incorporating a minimum 300mm of subsoil and 300mm of top soil in all future garden and landscaped areas.

See Appendix A2 for more information on remediation strategies.

4.0 Verification/Validation Report

4.1 Following completion of remediation works, the developer will be required to submit a verification report to the local authority for approval. This should be submitted before construction works commence, unless the remediation forms part of the construction process (e.g. placement of cover layers in garden areas or installation of gas protection measures in buildings). The verification report should provide confirmation that all measures outlined in the approved remediation strategy have been successfully completed, including where appropriate, validation testing. The report should include:

- A summary of the works carried out and the risks that have been managed;
- Validation sampling of any imported soils, including details of the source of material and appropriate analysis;
- All laboratory and *in-situ* test results and, if applicable, monitoring results for groundwater and ground gas;
- Photographic and other media records;
- Certification of any gas protection measures installed in individual buildings;
- Waste management and disposal documentation ('Duty of Care'); and
- Confirmation that the remediation objectives have been met.

4.2 This report is very valuable for future owners of the properties as where contamination has been found and remediated, it should provide evidence to

confirm that the approved remediation measures have been completed i.e. photographs, results of validation testing etc. Failure to submit all this necessary documentation may lead to legal complications with the future use or sale of development/ housing. In particular the report will be necessary to prove that the development site is unlikely to be defined as contaminated land for the purposes of Part IIA of the Environmental Protection Act 1990.

4.3 In certain circumstances it will be necessary for the developer to conduct post-completion monitoring to verify that the remediation has been successful. This should be undertaken to the satisfaction of the local authority and the results of the monitoring should be submitted for review.

4.4 On large schemes where development may be phased, progressive discharge of the planning conditions may be possible provided a satisfactory verification report is received for each phase.

4.5 When the Council is satisfied that the site has been remediated and is suitable for use, the applicant and/or developer will be expected to sign a Certificate of Remediation to confirm that the site has been remediated in accordance with the scheme agreed by themselves and the council.

4.6 An example certificate is presented in Appendix A4. This certificate has no legal status other than documenting the discharge of the relevant planning conditions for the development. It does not confirm that the site is free from contamination, or that it might not, at some later date, be determined to be 'contaminated land' (as defined in Part 2A), or offer any kind of guarantee against other future regulatory action or enforcement.

See Appendix A3 for more information on verification reports.

5.0 Key Points

- It is important to identify the potential for contamination to be present at an early stage in order that unexpected costs and delays can be avoided should a potential problem be identified during development works.

- Contaminated land, and the potential for it, requires specialist advice from a suitably qualified consultant.

- All site remediation works should be fully documented and summarised as part of a post validation report submitted to Gateshead Council on completion of the ground works.

References (Useful Documents)

MANDATORY GUIDANCE

- Environmental Protection Act 1990: Part 2A Contaminated Land – DEFRA Circular September 2006, www.defra.gov.uk
  Department for Environment Food and Rural Affairs, Circular 1/2006, Environmental Protection Act 1990: Part 2A, Contaminated Land, 2006
  www.defra.gov.uk/environment/land/contaminated/pdf/circular01-2006.pdf

- The Contaminated Land (England) Regulations 2000
- The Environment Act 1995
- The Environmental Protection Act 1990

ADVISORY GUIDANCE

- Model Procedures for the Management of Contaminated land (CLR11): 2004
  Department for Environment Food and Rural Affairs & Environment Agency, Model Procedures for the Management of Land Contamination – Contaminated Land Report 11 (CLR11), 2004
  www.environmentagency.gov.uk/commondata/105385/model_procedures_881483.pdf

- Environment Agency, Human health toxicological assessment of contaminants in soil (Science Report Final SC050021/SR2), 2009
- Environment Agency, Updated technical background to the CLEA model (Science Report Final SC050021/SR3), 2009
- CLEA software V1.04 licence agreement (PDF, 114KB)
- BS 10175:2001 – Investigation of Potentially Contaminated Sites – Code of Practice
- Environment Agency/NHBC R&D Publication 66 - 'Guidance for the Safe Development of Housing on Land Affected by Contamination', 2008
- Planning Policy Statement 23: Planning and Pollution Control: 2004
  Office of the Deputy Prime Minister, Planning Policy Statement 23: Planning and Pollution Control (PPS23), Annex 2: Development on Land Affected by Contamination, 2004

www.communities.gov.uk/documents/planningandbuilding/pdf/pps2annex2.pdf

- DOE (Department of the Environment) Contaminated Land Research Report: Guidance on Preliminary Site Inspection of Contaminated Land: 1994.
- DOE Contaminated Land Research Report: Sampling Strategies for Contaminated Land: 1994.
- BRE Construction of New Buildings on Gas Contaminated Land: 1991.
- Environment Agency, Methodology for the Derivation of Remedial Targets for Soil and Agency R&D Groundwater to Protect Water Resources, R&D Publication 20,1999
- DoE, 1995 Industry profiles (various titles)
- CIRIA, 1995 Remedial Treatment for Contaminated Land, SP 104,Classification and Selection of Remedial Methods
- DoE, 1994 Guidance on Preliminary Site Inspection of Contaminated Land, CLR2
- DoE, 1994 Sampling Strategies for Contaminated Land
- EA, 2001 Secondary Model Procedure for the Development of Appropriate Soil Sampling Strategies for Land Contamination
- INFO-PM2b CIRIA, 1996 A Guide for Safe Working on Contaminated Sites, R132
- CIRIA C659, Assessing risks posed by hazardous ground gases to buildings, 2006
- The Chartered Institute of Environmental Health: The Local Authority Guide to Ground Gas, 2009
- Chartered Institute of Environmental Health and Land Quality Management, Generic Assessment Criteria for Human Health Risk Assessment, 2006
www.lqm.co.uk/lqmpress/0823%20GAC%20web%20brochure.pdf
- British Standards Institute, BS5930:1999 Code of practice for site investigation, 1999
www.bsi-global.com/en/Shop/Publication-Detail/?pid=000000000030176112

- Environment Agency, Guidance on Requirements for Land Contamination Reports, 2005 www.environment-agency.gov.uk/commondata/acrobat/devguidev1_1155225.pdf
- Environment Agency, Remedial Targets Methodology – Hydrogeological Risk Assessment for Land Contamination, 2006 publications.environment-agency.gov.uk/pdf/GEHO0706BLEQ-e-e.pdf

- National House-Building Council, Environment Agency and Chartered Institute of Environmental Health, Guidance for the Safe Development of Housing on Land Affected by Contamination - R&D Publication 66, 2008 publications.environment-agency.gov.uk/pdf/SR-DPUB66-e-e.pdf?lang=_e

Appendix A1

PHASE 2:- The Quantitative Risk Assessment

B.	Requirements
1	Review of any previous site contamination studies (desk based or intrusive) or remediation works
2	Site investigation methodology to include: • Methods of investigation and justification of exploration sampling and analytical strategies • Scaled, annotated plan showing exploration locations, on site structures, storage tanks etc
3	Results and findings of investigation: • Ground conditions (soil, gas and groundwater regimes, including made ground) • All laboratory results (laboratory must be MCERTS accredited) • Discussion of soil/gas/groundwater/surface water findings
4	Conceptual site model (diagrammatic and written, highlighting any changes to that in Phase 1
5	Risk Assessment at a minimum to be based on the contaminant source-pathway-receptor model. To include: • Severity of consequences • Likelihood of occurrence • Justification of any risk assessment models used • A suitable quantitative risk assessment (if required)
6	Recommendations for remediation (Justifications should relate to proposed end use of site, risk assessment findings, as well as technical and financial appraisal)
7	Recommendations for further investigation (if necessary)
8	Recommendations for intrusive contamination (if necessary) to include: • Identification of target areas for more detailed investigation • Rationale behind proposed design of investigation

Appendix A2

Remediation Strategy

B.	Requirements
1	Objectives of the remediation works
2	Detailed outline of the works to be carried out, to include: • Description of ground conditions (soil, gas, water) • Type, form and scale of contamination to be remediated • Remediation methodology, including remedial, protective or other works • Scaled site plans/ drawings • Phasing of works and approximate timescales
3	• Consents, agreements and licences (discharge consents, waste management licence, asbestos waste material removal licence etc)
4	Site management procedures to protect site neighbours, environment and amenity during works including (where appropriate): • Health and safety procedures • Dust, noise and odour controls • Control of surface run off
5	Details of how any necessary variations from the approved remediation strategy arising during the course of works will be dealt with.
6	Details of how the works will be validated to ensure the remediation objectives have been met, including details where appropriate on: • Sampling strategy • Use of on-site observations, visual/olfactory evidence • Chemical analysis and monitoring data • Proposed clean-up standards (i.e. contaminant concentrations)
7	Recommendations for further investigation (if necessary)

Appendix A3

Post Remediation Verification Report

C.	Requirements
1	Include information as per B (1) to B (6)
2	Details of who carried out the work
3	Details and justification of any deviation(s) from the original Remediation Statement
4	Substantiating data. This should include where appropriate: • Laboratory and in situ test results (laboratory to be MCERTS accredited) • Post remediation monitoring results for groundwater and gases • Summary data plots and tables relating to clean up criteria. • Plans showing treatment areas and details of any deviations from the original remediation statement • Details of material removed from the site (volume, final disposal and waste management documentation etc) • Details of material brought onto the site (volume, details of source, test results* **All imported materials to be tested to prove that it is free from contaminants.*
5	Confirmation that remediation objectives have been met

Appendix A4

Certificate of Remediation: Example

CERTIFICATE OF REMEDIATION

To be completed the applicant and developer

This is to certify that the scheme of remediation*, decontamination and reclamation at the site known as:

at National Grid Reference:

in relation to planning approval reference:

was carried out between the dates: and:

and was completed to the agreed specification in the document:

Document Reference: Date:

[and subsequent agreed amendments:

Document Reference: Date:]

which were designed to afford protection from contamination* on the site to all identified receptors*.

Signed: Date:

Name:

Position:

Company Name:

Company Address: