

# SPG

supplementary planning guidance

## Development of land potentially affected by contamination



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West Lothian  
Council



## Supplementary planning guidance

### DEVELOPMENT OF LAND POTENTIALLY AFFECTED BY CONTAMINATION

#### Introduction

1.1 The purpose of this supplementary planning guidance is to provide developers and their consultants with information on dealing with the planning process in West Lothian when development is proposed on land which is suspected of being affected by contamination. West Lothian has a rich industrial heritage, the legacy of which is that a number of sites across the district may be contaminated due to the nature of their former use.

1.2 This document takes into account legislation relating to contaminated land and provides guidance on site investigation and risk assessment, which will be required by the council's Development Management and Building Standards units when determining planning applications and building warrant applications. If contamination is found to be posing a potential risk to human health or the wider environment, planning conditions will be attached to any consent to secure remediation of the land. **Planning permission and building warrants may be refused where the council is not satisfied that the site has been fully characterised, or that appropriate measures are in place to ensure the safe remediation of the site.**

1.3 Site investigation and contaminated land risk assessment is a complex process and should be carried out by appropriately qualified and experienced individuals. West Lothian Council will only accept site investigation reports that have been carried out in accordance



with the relevant British Standards, good practice and current authoritative guidance.

#### Legislative and policy context

2.1 The contaminated land regime, implementing the provisions of Part IIA of the Environmental Protection Act 1990 (as inserted by section 57 of the Environment Act 1995) came into force on 14 July 2000 (OPSI, 1995). The regime places a statutory duty on local authorities to inspect areas of land within their boundary and assess whether they may be classed as contaminated. Any land which is

determined as *Contaminated Land* (according to the specific legal definition set out by Part IIA) will be placed on a public register and can then be subject of a *Remediation Notice*. Generally, the costs of remediating the land will either be met by the person, or persons, who *caused or knowingly permitted* the contamination or, if they cannot be found, the owner of the land. Often in cases of historic contamination, the original polluter cannot be found, and liability for remediation of the contamination is decided by a legal process.

2.2 Part IIA defines land as *contaminated land* if it appears to be in such a condition, by reason of substances in, on or under the land that:

- (a) significant harm is being caused or there is a significant possibility of such harm being caused; or
- (b) significant pollution of the water environment is being caused or there is a significant possibility of such pollution being caused.

Alongside the legislation that came into force in July 2000, the Scottish Government published Statutory Guidance (Scottish Government, 2006) and the Contaminated Land (Scotland) Regulations 2000 & 2005 (OPSI, 2005). These documents provide assistance in defining and identifying contaminated land, as well as providing definitions of when *harm* or *pollution* is deemed to be *significant*.

2.3 The Statutory Guidance sets out the principle of the pollutant linkage when assessing land contamination. A pollutant linkage is made up of three components: a source, pathway and receptor. If a source of contamination is present on land and has the ability to cause harm or pollution to a receptor, such as a human being or a water body, through a pathway, then a potential pollutant linkage is present. If the pollutant linkage is causing *significant harm* or *pollution* (as defined in the Statutory Guidance) then it is termed a *significant pollutant linkage* and the land can be identified as *contaminated land*. Any land identified as such will appear on a public register, alongside details of the actions taken to secure its remediation. A list of statutory receptors is included in Table A in Paragraph A.24 of the Statutory Guidance.

2.4 Through its *Contaminated Land Inspection Strategy* (WLC, 2001), the council is dealing with land which is potentially causing harm or pollution in its current use. However, many brownfield sites are proposed for development incorporating a change of use through the land use planning process. The regeneration of brownfield sites is consistent with the council's policy on sustainability, and is often attractive to developers where development



would enhance the value of the land and cover the cost of remedial work. It is the role of the developer and the council's Development Management and Building Standards units to ensure that any land subject to a planning application or building warrant is suitable for its new use and, as such, contamination is a material planning consideration.

2.5 The Scottish Government published Planning Advice Note 33 – *Development of Contaminated Land* (PAN 33) in October 2000 (Scottish Government, 2000). This discusses the *suitable for use* approach in more detail and makes reference to the differences between the local authority's role in assessing **current use** of land under Part IIA, and **proposed future use** through the planning system. Paragraphs 74 and 75 of PAN 33 make it clear that it is in the developer's best interests to ensure all potential Part IIA liabilities are dealt with prior to development, in order to avoid a potential Part IIA re-assessment under the contaminated land regime.

2.6 The adopted *West Lothian Local Plan* (WLC, 2009) sets out a development strategy for West Lothian. Chapter 11 of the plan includes Policy NWR 22 that states:

*Where it is suspected by the council that a development site may be contaminated, a developer will be required to undertake a site investigation and risk assessment, to the council's specifications. If contamination at the site is shown to present an unacceptable risk to human health or the environment following the proposed change of use, the developer must submit a programme of remedial works, to be agreed by the council, prior to planning permission being issued. The developer must appoint an accredited consultant to carry out the site investigation and risk assessment, and planning conditions will be applied to secure any necessary remedial works.*

Consequently, the onus is on the developer to justify to the council's Development Management and Building Standards units, that a development site does not pose an unacceptable risk from contamination, for its proposed new use. Development Management and Building Standards will consult with the council's Contaminated Land Officer or, if required, an independent consultant, to ensure that the site investigation is compliant with British Standards and current good practice and that any proposed remedial works manage the identified risk.

2.7 If the council is not satisfied that enough information has been provided at the detailed stage of a planning application, then this may result in the refusal of the application. Where the council has granted a planning application with a suspensive planning condition relating to land contamination, development will not be allowed to proceed until the council is fully satisfied that the risks have been assessed and managed.

2.8 Occasionally, development works are not subject to the requirements of the planning process; or the presence of contamination is not known until after planning



permission has been granted. In these cases the Building (Scotland) Regulations 2004 (OPSI, 2004) can provide powers to ensure the structure of buildings or their proposed occupants are not affected by contamination. Regulation 9 states:

*"Construction shall be carried out so that the work complies with the applicable requirements of Schedule 5".*

Schedule 5, paragraph 3.1 states:

*"Every building must be designed and constructed in such a way that there will not be a danger to the building nor a threat to the health of people in and around the building due to the presence of harmful or dangerous substances."*

It is expected that the contaminated land regime and planning process will address the majority of land contamination issues in West Lothian. However, if the presence of contamination is not known until after planning permission has been granted, the council's Building Standards unit has the power to insist an investigation is carried out before a building warrant is issued.

## Contamination through historical land use

3.1 Land may be contaminated by a wide range of substances and materials in the form of solids, liquids or gases. Contaminants may be spread across a site, or concentrated in pockets; readily identifiable, or hard to detect. They may be mixed with topsoil, with inert waste materials, or buried beneath clean material.

3.2 The nature and extent of contamination is highly dependent on the former use of the site. The economy of a number of towns and villages in West Lothian was founded on shale and coal mining, steel and associated industries. It is the legacy of these former industries that is likely to cause the major contamination issues in West Lothian. However, other industrial land uses such as landfill sites, scrap yards, petrol filling stations, engineering works, paper mills and railway land can also give rise to contamination. Some agricultural activities can also act as a source of contamination. Therefore, greenfield sites should not be assumed to be free from contamination.

3.3 The Scottish Environment Protection Agency (SEPA), the Environment Agency and the Department of the Environment, Food and Rural Affairs (DEFRA) have published guidance to assist stakeholders identify which types of land might be contaminated and the groups of chemicals and substances potentially present on them. The Department of the Environment has published a set of *Industry Profiles* in which common UK industries are described in detail, and working practices are linked to groups of potential contaminants (DoE, 1995). These documents are available to download from the Environment Agency's website (see Section 8.3).

## Site investigation and risk assessment

4.1 Site investigations are usually highly structured operations consisting of several phases. A phased approach is necessary to ensure resource is not wasted, as each phase of the investigation informs the next and therefore sampling and analysis can be targeted at areas of a site that are at a greater risk.

4.2 The Environment Agency document CLR 11, *Model Procedures for the Management of Land Contamination* (Environment Agency, 2004) outlines the steps to be followed when assessing the risk from potential land contamination. A tiered risk assessment approach is recommended, incorporating a *Preliminary Risk Assessment*, followed by a *Generic Quantitative Risk Assessment* and then a *Detailed Quantitative Risk Assessment* if deemed necessary. This approach is described below; but site assessors should refer to CLR 11 for full details.

4.3 The aim of the site investigation is to determine whether any potential pollutant linkages are present, and therefore whether any remediation will be necessary prior to, or as part of development. The process of firstly identifying potential pollutant linkages and then determining whether they are actually present is described below. It is essential that a suitable amount of site data is collected so that confident conclusions can be made on each potential pollutant linkage. If a site is not fully characterised initially, this may delay the process of obtaining planning permission, as further site investigation is likely to be required.

### **Phase 1 (desk study and site reconnaissance)**

4.4 The purpose of the first phase of the investigation is to compile as much information about the site as possible. Most important is the former use of the site, which can be sourced from historical maps, aerial photographs, trade directories and anecdotal evidence amongst other sources. Once the former use of the site has been established, a set of possible contaminants can be compiled. As discussed in Section 3.3, the Environment Agency and DEFRA have published a range of guidance to link contaminants to former use. It may be that West Lothian Council holds information on a particular site, whether it is archived waste disposal site files, or information collected during a Part IIA inspection. The council can be consulted on any site in the district using the contact details provided in Section 9.1.

4.5 In order to assess the potential risk to statutory receptors, the site's geology, hydrogeology and hydrology must be understood. Geological maps are available



from the British Geological Survey, as is hydrogeological information and groundwater vulnerability maps. Research and guidance on the vulnerability of groundwater bodies in Scotland has been published by the Scottish and Northern Ireland Forum for Environmental Research (SNIFFER, 2004). SEPA may hold additional information on surface and groundwater at or near a site. A site's geology can act as a source, pathway or receptor, and therefore it is vital that it is characterised and understood.

4.6 The current and proposed uses of the site should also be assessed during the Phase 1 investigation in order to understand which types of receptors could be affected by any contamination. For example, a site proposed for commercial or industrial use will be quite different from a housing development in terms of the potential risks to receptors.

4.7 A site reconnaissance visit is an essential part of the Phase 1 process. The site visit can validate or update information collated during the desk study; can be used to collect information on potential sources, pathways and receptors which were not clear from the desk study; and can assist in the planning of any further field investigations. Site reconnaissance can also be used to collect vital anecdotal evidence through interviews with local residents or site workers. Limited sampling and field tests can be carried out if necessary.

4.8 On completion of the Phase 1 investigation, the site assessor should have information on possible sources, pathways and receptors. This enables the assessor to construct an initial **conceptual site model** of the site. This model can be in text, schematic or graphical format and should describe succinctly each potential pollutant linkage, and importantly, the limitations of the model. This informs the *Preliminary Risk Assessment* stage of the tiered risk management framework described in CLR11. The conceptual site model can then be

used to design any required Phase 2 investigations. Sampling can be targeted at specific areas of the site (e.g. the tank farm in a former oil works), and risk assessment carried out dependent on identified receptors at the site. The conceptual site model is the cornerstone of contaminated land risk assessment and should be updated as the various phases of site investigation and tiers of risk assessment are progressed. The limitations identified in the initial conceptual site model should reduce as site investigation data is collected and risk assessment is progressed. Detailed guidance on the development of conceptual site models has been published by the Environment Agency (2001). It should be noted that the Phase 1 investigation may indicate that there are no possible pollutant linkages on a site and the investigation can be concluded.

### **Phase 2 (intrusive site investigation and risk assessment)**

4.9 This phase of the investigation involves intrusive sampling on the site in the form of soil, groundwater, gas and surface water sampling. Sampling strategies can be designed using the initial conceptual site model developed in the Phase 1 investigation, in order to maximise resource efficiency and ensure all potential sources are characterised. A sufficient number of samples should be collected to fully characterise the site. Samples taken should be collected and stored appropriately, and transferred to a suitable laboratory for chemical and geotechnical analysis.

4.10 Any chemical analysis data of samples taken from a site should be *fit for purpose* and analysed by an appropriately MCERTS or UKAS accredited laboratory in accordance with a robust quality assurance system. The analysis should include all contaminants identified through the Phase 1 *Preliminary Risk Assessment* that have the potential to be present on site and, where appropriate, sampling of relevant individual species of compounds such as petroleum hydrocarbons and polycyclic aromatic hydrocarbons should be included. The council may require



to see information on the testing processes undertaken and certificates that relate to the calibration of the equipment used. Any document outlining the results should include a detailed plan of the site showing where the samples were taken. Borehole and trial pit logs should be included in *Site Investigation Reports*, and should include details of depth to groundwater, depth of samples taken, and an appropriate description of each geological unit found. Laboratory analysis certificates should also be included in submitted *Site Investigation Reports*.

4.11 Following the receipt of laboratory analysis certificates, the results can be inputted into a risk assessment framework. As discussed in Section 4.2, CLR11 provides a framework for the assessment of risks to human health, and the council would prefer to see this used.

This follows a tiered approach whereby laboratory test results are firstly compared to generic assessment criteria (GAC) as part of a *Generic Quantitative Risk Assessment*. GAC are soil concentration values derived for a generic scenario (e.g. a residential situation) taking into account the known toxicology, fate and behaviour of the contaminant; the types of soils commonly found in the generic scenario; and the type of human behaviour normally present in such a scenario, amongst other factors. They are usually highly conservative, minimal risk levels and should not be used to indicate the threshold at which there is the *significant possibility of significant harm*. If GAC are not exceeded at the site, and provided that the site has been characterised appropriately, it can be concluded that there is not a significant risk to human health from that particular contaminant.

4.12 GAC have been derived by the Environment Agency in the form of Soil Guideline Values (SGVs) using the Contaminated Land Exposure Assessment (CLEA) model. This model has recently been updated by the Environment Agency and guidance published to reflect the new approach (Environment Agency, 2009a, 2009b). Previously published guidance and SGVs have been withdrawn and are being replaced over time. The council would expect to see the new approach used during contaminated land risk assessment. At the time of



writing, only a limited number of SGVs have been published, and site assessors will be required to either derive GAC themselves, or use GAC published by other respected UK bodies. There are a number of risk assessment tools available to site assessors to derive GAC, including CLEA v1.06, a freeware computer model available to download from the Environment Agency's website. Other models can be used, but assessors should ensure these follow the framework outlined in CLR11 and the CLEA guidance documents, and are appropriate to the proposed land use and conceptual site model.

4.13 If it is found that concentrations of contaminants have exceeded GAC, it may be necessary to carry out a *Detailed Quantitative Risk Assessment*. As part of this tier of the risk assessment process, a site assessor can be expected to derive site specific assessment criteria (SSAC). The derivation of these values incorporates information collected from the site investigation that can be inserted into an appropriate risk assessment tool to remove some of the conservative assumptions used in the derivation of GAC. Laboratory test results can then be compared with the SSAC to determine whether there is an actual risk to human receptors. If SSAC are exceeded, it is likely that some form of remediation will be required.

4.14 Guidance on the assessment of risks posed by contaminants to the water environment has been published by SEPA (2009a, 2009b), and the council will expect to see this approach used. As with human health risk assessment, it is important that the water environment is characterised appropriately. This should include an assessment of all water bodies present on a site, and whether they may act as a pathway or a receptor,

which direction water bodies are flowing in and whether continuity may exist between water bodies which act as a pathway and those which are receptors. The *Statutory Guidance* provides information on the *seven measures of significant pollution*, and this is expanded upon in the above referenced SEPA documents.

4.15 Guidance on the assessment of risks posed by contaminants to ecological receptors has been published by the Environment Agency (2008), and the council will expect to see this framework followed where there is potential harm to statutory ecological receptors.

4.16 Many brownfield sites are capable of producing and hosting hazardous ground gases. These can be released from the degradation of organic matter in made ground, bacterial activity in a landfill site or from natural sources such as coal measures bedrock. The primary gases of concern are carbon dioxide, an asphyxiant, and methane, which is explosive under



certain conditions. Where significant quantities of made ground are present, or there is a landfill source, or the site is underlain by coal measures, a gas risk assessment is likely to be required. Guidance on how to measure and risk assess ground gas has been published in both CIRIA C665 (CIRIA, 2007) and British Standard BS8485:2007 (BSI, 2007).

4.17 Any site investigation should be carried out in accordance with British Standards BS5930:1999 and BS10175:2001 (BSI, 1999, 2001). Intrusive site investigations need to be appropriately designed to collect the right quality and quantity of information, and risk assessment undertaken in such a way that is protective of human health and the environment. As is discussed in detail in CLR11, it is important that a site is fully characterised and the conceptual site model can be justified before any conclusions can be drawn on whether remediation is necessary. In many cases, *Site Investigation Reports* will need to be approved by the council prior to the planning application being determined.

## **Remediation of land contamination**

5.1 If it is shown that the proposed use of the site would present an unacceptable risk to human health or the wider environment, developers must provide the council with a comprehensive *Remediation Strategy* detailing the remedial works that are required to remove identified pollutant linkages. In many cases, *Remediation Strategies* will be agreed with the council prior to the application being determined.

5.2 CLR 11 recommends that if remediation of a site is required, the site assessor should carry out an appraisal of the remedial options. This *options appraisal* stage involves identifying feasible remedial options for the pollutant linkages present; carrying out a detailed evaluation of each option to determine the most suitable for the site in question; and producing a *Remediation Strategy* that addresses all pollutant linkages, incorporating more than one option if necessary. The council may require evidence that this process has been carried out before approving a *Remediation Strategy*.

5.3 The council would prefer to see the sustainability of the remedial actions considered as a factor during the *Options Appraisal* stage. Remediation projects can consume significant amounts of energy and emit large quantities of greenhouse gases. Poor risk assessment during the site investigation stage can also result in soil resources being wasted, for example being removed from site when this is unnecessary. The Sustainable Remediation Forum UK (SURF UK) promotes the use of sustainable practices during the implementation of remedial actions, and information is available on their website (SURF UK, 2009).

5.4 Remediation of a site involves the breaking of the pollutant linkage(s) causing the site to be unsuitable for use or posing an unacceptable risk. This can take the form of complex work on the soil to reduce contaminant concentrations, or can simply involve minimising a receptor's contact with a contaminant, e.g. placing a fence around a contaminated area. The council's Environmental Health unit and, where appropriate, SEPA will be consulted on the **Remediation Strategy** to ensure that the proposed works do not cause pollution, introduce a risk to public health or cause nuisance to neighbouring development. Environmental Health may require as part of any *Remediation Strategy*, monitoring of airborne dust and/or airborne contaminants where appropriate.

5.5 Depending on the final agreed *Remediation Strategy*, a licence may be required from SEPA. Prior to carrying out remedial works on site, it is recommended that developers contact the local SEPA office to ensure that all necessary licences and permits are in place.

5.6 It should be noted that further contamination is often found during remedial works, and therefore developers should make provision for the extra time and cost it may take to deal with this situation, should it arise.

5.7 Any site works should be undertaken in accordance with The Construction (Design and Management) Regulations, 2007 (OPSI, 2007). The health and safety of contractors and sub-contractors on potentially contaminated development sites is a matter for the developer and the Health & Safety Executive.

### **Verification of remediation of land contamination**

6.1 Following remediation, verification that the *Remediation Strategy* has been successful in removing pollutant linkages is necessary. The council will not discharge any planning condition relating to land contamination until a *Verification Report* has been submitted and approved in writing.

6.2 *Verification Reports* should include details of the potential pollutant linkages identified and the measures taken to manage the risks associated with them. Verification data may include laboratory test results, groundwater and gas monitoring results, site photographs and plans showing areas of land remediated. Draft guidance on the verification of remediation of land contamination has been published by the Environment Agency (DRAFT).

6.3 Details of the type of information the council expects to see included in *Site Investigation Reports*, *Remediation Strategies* and *Verification Reports* are included in Appendix A. It should be noted that the information is intended as a guide to aid

developers with their planning application submission to Development Management, but they are in no way exhaustive. Each site is different in character and risk, and therefore each report will be different. However, if key parts of a *Site Investigation Report* are missing, it is likely the report will be rejected until complete.

### Summary of developer requirements

7.1 When a planning application is submitted to the council's Development Management unit, the applicant should answer the question relating to land contamination, taking care to consider the previous use of the site and whether contamination is a possibility. In cases where it is not known whether the site is contaminated, applicants should consult with the council's Contaminated Land Officer. If there is a possibility of contamination being present, a site investigation will be required.

7.2 Where the application is for planning permission in principle, a Phase 1 *Site Investigation Report* will ordinarily be submitted to, and approved by the council prior to the application being determined. Where further phases of investigation are required, these can be attached as conditions to any granted planning consent.

7.3 Where the application is for full planning permission, the condition of the land and any remedial requirements will ideally be known before the determination date. Phase 1 and 2 *Site Investigation Reports* and will ordinarily be submitted to, and approved by the council prior to the determination of the planning application. The council recognises that this is not always possible due to site specific factors, e.g. clearance of buildings or underground structures, and each case will be assessed on its merits. Where site investigation is not possible until planning permission has been granted, a suspensive condition relating to the investigation and remediation of the site will be included on the planning consent.

7.4 Where site investigation and risk assessment determines that some form of remediation is required, a *Remediation Strategy* will ordinarily be submitted to the council for approval prior to the determination of the planning application. Conditions relating to the remediation of the site would then be added to any planning consent.

7.5 Following remediation, a *Verification Report* will be submitted for approval by the council. Planning conditions relating to land contamination will not be discharged until the VERIFICATION REPORT has been received and approved by the council.

7.6 Details of what is required to be included in *Site Investigation Reports*, *Remediation Strategies* and *Verification Reports* are included in Appendix A (although see Section 6.3). Further guidance notes on common issues encountered during the site investigation and risk assessment process are included in Appendix B. It is envisaged that this appendix will be updated as new guidance is published, and developers are advised to see the council's website for updates.



7.7 Where planning permission is granted for a site on which the presence of contamination is known or suspected, an advisory note will be attached to the planning permission informing the applicant that the responsibility for the safe development of the site rests with the developer. It will also state that the council has determined the application on the basis of the information available to it, but this does not mean that the land is free from contamination.

7.8 Throughout the planning process, the council's Contaminated Land Officer will be available to discuss specific points about site investigation and the council's requirements. However, the council will not design a site investigation scheme for developers, and appropriately qualified and experienced consultants should be contracted to carry out the work. Applicants are strongly advised to enter into pre-application discussions with both Development Management and the Contaminated Land Officer, if contamination is suspected at a site.

7.9 The cost of the site investigation, risk assessment and any remedial action will be borne solely by the developer.

7.10 The council will endeavour to review all reports submitted relating to land contamination within 28 days. Where this is not possible, a full explanation will be provided to the applicant.

### Published guidance

8.1 The legislative text of [Part IIA of the Environmental Protection Act 1990](#) and the [Contaminated Land \(Scotland\) Regulations 2000](#) and [Contaminated Land \(Scotland\) Regulations 2005](#) are held on [legislation.gov.uk](#). The [statutory guidance for implementing Part IIA](#) is published on the [Scottish Government's website](#).



8.2 Comprehensive guidance for developers is contained in [Planning Advice Note 33 – Development of Contaminated Land](#) (PAN 33). This is held on the [Scottish Government's website](#).

8.3 General guidance on managing contaminated land is published on the Environment Agency's website in the form of CLR 11 [Model Procedures for the Management of Land Contamination](#) (Environment Agency, 2004). The [Environment Agency's website](#) also contains a wealth of information on site investigation and risk assessment methodologies as well as the CLEA model.

8.4 Site investigations should be carried out in accordance with British Standards BS 10175:2001 [Investigation of Potentially Contaminated Sites – Code of Practice](#); and BS 5930:1999 [Code of Practice for Site Investigations](#). Developers should appoint consultants who promote the practices detailed in these standards. The standards are available on the British Standards website ([www.bsonline.bsi-global.com](#)).

8.5 Information on land contamination and the water environment is available on the [SEPA website](#).



### **Further information**

For further information or advice on land contamination issues please contact the council on 01506 280000

Email: [environment@westlothian.gov.uk](mailto:environment@westlothian.gov.uk)

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## **Appendix A Summary of details present in reports published with respect to land contamination**

It should be noted that this appendix is not meant as a checklist or definitive list of items required to be present in reports issued to West Lothian Council. Some items detailed below may not be appropriate or necessary. Conversely, other items of information may be necessary for a particular site situation, and have not been detailed below.

This is particularly true for *remediation strategies* and *verification reports*, because by this part of the process, the issues are highly site specific. Practitioners should have regards to the wealth of guidance published for each part of the process, and remember that every site is different, and therefore each report should be different.

Phase 1 Reports (Desk study and site reconnaissance)

Purpose, aims and legal context of the investigation;

Site location and proposed development layout plan;

Appraisal of the site and surrounding site history, incorporating review of historical plans, site records, other documentary sources and anecdotal evidence;

Assessment of the site's environmental setting, to include:

- Geology, hydrogeology, hydrology including off site water receptors
- Information on mining or quarrying activity
- Information from SEPA
- Information from West Lothian Council on former waste disposal sites, private water abstractions, contaminated land, underground storage tanks, etc
- Information from trade directories
- Drainage, services (including culverted watercourses), wells and piling activities on the site
- Details of the site surface including estimated % area of hard surfacing
- Details on the underlying aquifer classification and vulnerability;

Review of any previous site investigation reports or remedial works;

Summary of information recorded during the site reconnaissance visit;

Conceptual Site Model in either textual, schematic or graphical format including the limitations of the model;

Preliminary Risk Assessment to incorporate an appraisal of all potential sources, pathways and receptors. This should take into account the likelihood of occurrence and the severity of consequences, and whether potential pollutant linkages warrant further investigation;

Recommendations for further work, to include:

- Justification for closure of site investigation (if applicable)
- Production of a Field Work Plan for future investigation
- Rationale behind proposed design of intrusive investigation, including contaminants of concern, sampling techniques and sampling locations.

Phase 2 Reports (Site Investigation and Risk Assessment)

Purpose, aims and legal context of the investigation;

Site location and proposed development layout plan;

Review of any previous site investigation reports, including Phase 1 studies;

Initial Conceptual Site Model: Identification of all potential sources, pathways and receptors, including the limitations of the model;

Site investigation methodology, to include:

- Methods of investigation, including justification for the methods used
- Detailed plan showing site investigation locations, justification of locations and depth of sampling. Plans should be drawn to scale and GPS used to accurately map site investigation locations
- Chemical analysis suites, including a justification for the contaminant groups selected

Results and findings of investigation, to include:

- Sampling and analysis data of soil, groundwater, surface water and gas monitoring
- Borehole and trial pit logs, laboratory analysis sheets and quality control details
- Discussion of the ground conditions found including the type and thickness of geological horizons, soil descriptions and depth to groundwater
- Any visual or olfactory evidence noted during the intrusive investigation
- The vertical and lateral extent of any contamination found during the investigation;

Risk assessment:

- Should be compliant with CLR 11 taking into account the proposed end use of the site
- Initial generic quantitative risk assessment (GQRA) including justification of the generic assessment criteria used, and details of their derivation if applicable
- Site-specific detailed quantitative risk assessment (DQRA) may be required depending on the findings of the GQRA. Details of the derivation of SSAC should be provided if applicable
- Should provide electronic copies of risk assessment sheets if possible, e.g. CLEA v1.04, Remedial Targets Methodology spreadsheets.
- Details of identified pollutant linkages
- Limitations of the risk assessment, and any key assumptions made;

An updated Conceptual Site Model following the site investigation and risk assessment. This should include any remaining uncertainties. A geological cross section may be necessary for sites with complex geological or hydrogeological profiles.

Recommendations for further field work, if necessary;

Recommendations for remedial action to include:

- Conclusions of the risk assessment
- Details of the pollutant linkages requiring remediation
- Technical Options Appraisal, as described in CLR1 1
- Favoured remedial option

All factual information should be included e.g. figures, borehole and trial pit logs, laboratory analysis sheets, gas monitoring data, statistical calculations, derivation of assessment criteria, sub-contractors reports, site photographs.

Remediation Strategies

Aims and objectives of the remediation, with reference to previous site investigation and risk assessment;

Summary of the pollutant linkages requiring remediation;

Technical Options Appraisal, as described in CLR11;

Preferred remedial option(s), including details of how the remediation strategy will deal with all identified pollutant linkages;

Conceptual Site Model of Remediation;

Identification of the lines of evidence for the verification of the Remediation Strategy;

Detailed outline of the works, to include:

- Description of ground conditions (geology, hydrogeology)
- Characteristics of the pollutant linkages to be remediated
- Remediation methodology, including technical justification of the suitability of the works
- Site plans/drawings showing the extent of the remedial works
- Phasing of works and appropriate timescales

Consents, agreements, permits and licences (e.g. discharge consents, waste management licences, mobile plant licences)

Site management procedures and mitigation plans to protect site neighbours, the environment and amenity during works, including where appropriate:

- Health and safety procedures
- Dust, vapour, noise and odour controls
- Control of surface run off
- Contingency plans for dealing with complaints or environmental issues

Details of how any necessary variations from the approved Remediation Strategy arising during the course of the works will be dealt with, including notification to the council's Development Management unit;

Details of a communications plan to keep local residents, community council's, and regulatory bodies up to date with site operations;

Details of how the works will be verified to ensure the remedial objectives have been met, to include:

- The type of data which needs to be collected
- Sampling strategy, if applicable
- Use of on-site observations, visual/olfactory evidence
- Use of photographs
- Chemical analysis data

- Justified remediation targets for soil/groundwater, if applicable, including their derivation
- Whether verification will be undertaken on a phased basis or as part of a single operation, or whether long-term verification will be required
- An assessment of any potential pollutant linkages arising from the act of remediation itself, e.g. does the process create any contaminant breakdown products; are contaminants previously at depth now closer to the surface?

Details of contingency planning should it be found that the Remediation Strategy is not effective in managing all identified pollutant linkages.

#### Verification Reports

Summary of the site work carried out so far, including site investigation, risk assessment and identified pollutant linkages;

Details of the Remediation Strategy agreed to deal with the identified pollutant linkages;

Details of who carried out the remediation;

Details of and justification for any changes from the originally agreed Remediation Strategy;

Verification data, to include (where appropriate):

- Laboratory analysis results for soils, groundwater and surface waters
- Ground gas monitoring results
- Justification of the location and depth of any verification samples
- Summary tables for comparison with derived remediation targets for soil/groundwater
- Plans/drawings showing areas treated and details of any differences from originally agreed Remediation Strategy
- Site photographs, e.g. gas membranes being laid, proof of cover system thickness
- Waste transfer notes, if applicable, to ensure material has gone to an appropriate site.

Confirmation that the remediation objectives have been met;

Final Conceptual Site Model

## **Appendix B Additional notes on West Lothian Council requirements**

This Appendix contains specific advice on certain site investigation and risk assessment practices. The council will expect to see current UK good practice incorporated into site assessment at all times. This section will likely be added to as new guidance becomes available.

### **Site characterisation**

1. The sampling strategy applied by a practitioner during a site investigation should be robustly justified. A sufficient number and concentration of samples should be taken from a site to characterise it fully. The sampling scope will depend upon a number of factors, including the previous use of the site and the proposed use. Any contamination found should be delineated both horizontally and vertically and then a risk assessment carried out for each identified receptor. Guidance on sampling strategies is available in the Environment Agency's R&D Technical Report P5-066/TR, Secondary model procedure for the development of appropriate soil sampling strategies for land contamination (Environment Agency, 2000), available to download from the Environment Agency's website.

2. When comparing chemical analysis data on samples collected from a site with a critical concentration such as a GAC or SSAC, practitioners will often use statistical tests to determine whether a particular contaminant is elevated across an area or whether there are parts of that area which are not representative of the remaining site. Guidance has been published by CL:AIRE (2008) and site assessors should have regard to this and other published guidance on the use of statistics in the analysis of environmental samples. In particular, site assessors should be confident that there are a sufficient number of samples to carry out a valid statistical analysis, and that the conceptual site model allows for such an analysis. Site assessors should also take into consideration the effect of sample clustering and heterogeneity in ground conditions on the validity of the statistical analysis (Nathanail, 2004).

### **Risk assessment**

3. Analysis and risk assessment of petroleum hydrocarbons (often termed TPH) should be carried out with reference to the Environment Agency's Science Report P5-080/TR3, The UK approach for evaluating human health risks from petroleum hydrocarbons in soils (Environment Agency, 2005) available to download from the Environment Agency's website. This document advocates that petroleum hydrocarbons analysis should be split into 16 banded species of aliphatic and aromatic structure based on Equivalent Carbon (EC) number, and risk-assessed separately. Each species group has different toxicological, fate and transport properties and will therefore interact differently with each receptor. Similarly, analysis of polycyclic aromatic hydrocarbons (PAHs) should be speciated and each species risk-assessed separately.

4. Assessment of the risk of ground gases to a development should be carried out with regard to an appropriate reference document. The CIRIA document C655, Assessing risks posed by hazardous ground gases to buildings (CIRIA, 2007) provides thorough guidance on sampling and risk assessment methodologies, including the number of monitoring points which should be installed, and the frequency and duration of sampling rounds. Suggestions for ground gas remedial measures are also discussed, following suitable risk assessment.

Guidance on ground gas risk assessment is also contained in British Standard BS8485 (BSI, 2007) and NHBC Report Edition 04 (NHBC, 2007).

5. Where there are potential pollutant linkages relating to the water environment, it is likely that the council will consult SEPA and request site-specific advice. This consultation process will be carried out in accordance with the Local Authority – SEPA liaison procedure. Site assessors should have regard to the SEPA guidance on land contamination and the water environment contained in Water pollution arising from land containing chemical contaminants – 2nd Edition (SEPA, 2009b), available to download from the SEPA website.

### **Remediation and verification**

6. Many developers will select cover systems, containment or capping layers as a form of remediation for a site. While this is suitable in some circumstances, there are many situations where it is not suitable, e.g. where volatile contaminants are present, or where groundwater contamination is an issue. Cover systems should be engineered on a site-specific basis, and their depth and characteristics will vary from site to site. It is likely that the council will request a capillary break layer, geotextile membrane and other aspects to be designed into the cover system. Practitioners should also have regard to what effect a cover system might have on any ground gas regime at a site. Any material imported onto a site for use in a cover system will need to be verified to ensure it is not affected by contamination. Verification will involve providing details and the location of the source site, and an appropriate sampling regime on the material to ensure its suitability for use. Photographic verification of the depth of the cover system should also be provided.



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