

Contaminated Land Inspection Strategy



Contents

Executive Summary

1.0 Introduction	6
Corporate Aims of the Council	6
Dealing with Contaminated Land	6
Defining Contaminated Land	6
The Need for a Strategic Approach	7
The Development of the Strategy	7
Partnerships	7
Economy	7
Social	8
Natural Environment	8
2.0 The Borough of Chesterfield	9
Geology and Hydrology	9
Land Use	10
Protected Habitats	10
Key Property Types	10
Water Resources	10
Current and Past Historical Industrial Uses	10
Coal Mining	10
Iron Ore	11
Other Local Industry	11
Council Owned Land	12
3.0 Inspection Strategy Action Plan	13
Introduction	13
Key Objectives and Priorities	13
Background to Our Basic Approach – Risk Assessment	13
The Council's Procedures for Site Prioritisation and Investigation	14
Information Systems	15
Prioritisation	15
Categorisation	15
Site Investigation	16
Designation of "Contaminated Land"	16
Remediation	16
Post Remediation	17
Unscheduled Assessments and Triggers for Inspection	17
Special Sites	18
Information Registers	18
Interaction and Consultation	19
Working Programme	19
4.0 Prioritising Sites for Action	21
Introduction	21
The Basis for Chesterfield's Strategy	21
How These Techniques will be applied to Chesterfield Borough	22
Primary Zoning	22

Secondary Zoning	22
Priority Categorisation	22
Summary	23
5.0 Site Specific Information and Sources	24
Introduction	24
Internal Sources	24
Aerial Photography	24
Environment Agency	24
English Nature	25
Historical Data	25
Ordnance Survey Landline	25
Coal Authority	25
British Geological Survey	25
Health and Safety Executive (HSE)	25
Food Standards Agency	25
6.0 The Future	27

APPENDICES

Appendix 1: Glossary of Terms

Appendix 2: Geographical Information Systems

Appendix 3: References and Guidance

Appendix 4: Environmental Data Sets Available

Appendix 5: Contamination Standards

Appendix 6: List of Consultees

Appendix 7: Select List of Contractors

Executive Summary

Chesterfield Borough Council is committed to developing and promoting the Borough as an attractive place in which to live, work, visit and invest. The Council will seek to promote conservation and minimise environmental pollution through its own activities and its influence on others.

This Contaminated Land Strategy has been developed by Chesterfield Borough Council as part of its obligations defined in **Section 78 B(1) of Part IIA of the Environmental Protection Act 1990**. As part of this duty the Council will instigate the inspection of the Borough from time to time for the purpose-

- of identifying contaminated land; and
- identifying Special Sites.

Contaminated Land, as defined in the Act, is land that:

- may be causing significant harm or
- pollution of controlled waters.

The Council have adopted a **Strategic Approach** to the identification of contaminated land with the emphasis being on:

- human health;
- water resources and ecosystems;
- property and the built environment.

The Borough of Chesterfield (which includes Staveley and Brimington) consists of mixed residential and industrial areas with substantial areas of open countryside.

Traditional industries such as coal mining, iron and steel production, engineering and other heavy industry have declined leaving a legacy of potential environmental problems.

The Council currently owns over 550 properties in the Borough, some of which are known to have issues of land contamination.

In line with standard practice, the Council will adopt a **suitable for use** approach to the management of contaminated land. **Risk assessments** will be based upon the **Pollutant-Pathway-Receptor** scenario and the establishment of linkages between pollutants and vulnerable receptors.

The key stages of the Strategy are defined and explained within this report. They include:

- Site Prioritisation;
- Site Inspection;
- Site Investigation;
- Site Remediation;
- Post Remediation Management.

The procedures detail how the Council will identify and inspect land that may be contaminated. The strategy demonstrates how the Council will deal with sites that are found to be significantly contaminated such that they pose a risk to people, the environment or built structures. The Council is responsible for identifying who is liable for remediating contaminated sites. This is not a simple matter but there is a prescribed process for attributing liability between various groups or individuals who have an interest in the land. Where the land in question is in the ownership of the Borough Council, it will be responsible for its' remediation.

The Council will maintain a Register of information relating to contaminated land, which will be available for public inspection although some information may be declared commercially confidential. The strategy details how this information will be handled to ensure those parties who need to know will have access to the information under the Environmental Information Regulations.

The Council will establish formalised links both internally (between Council departments) and externally (with other organisations such as the Environment Agency and MAFF and more locally with community organisations and industry where appropriate). This will ensure efficient consultation, transfer of information, and transfer of regulatory control. Periodic monitoring of the implementation of the strategy will be undertaken by the Environment Agency as part of a 'State of the Environment' Report.

It is intended that the strategy will be adopted and published by June 2001.

This contaminated land strategy will ensure that the Council meets its obligations to protect human health, property and the wider environment. It will also drive the *remediation* of contaminated sites and encourage the re-use of brownfield land in line with the sustainability policies of the Council.

Introduction

Corporate Aims of the Council

Over a number of years the Council has developed its '**Vision for the Borough**', in which it states its commitment to developing and promoting the Borough as an attractive place in which to live, work, visit and invest. In partnership with other agencies it aims to:

- promote safe communities, sustainable development and health living;
- protect and care for the environment and
- improve the quality of homes and neighbourhoods for all residents".¹

Chesterfield Borough Council's **Environmental Charter** includes a declaration of commitment that:

"The Council will seek to promote the conservation and substantial use of natural resources and to minimise environmental pollution in all of its own activities and through influence over others. This Council will review its policies, programmes and services and will take action wherever possible to contribute to the protection and enhancement of the environment within the Borough".²

Chesterfield Borough Council have developed this Contaminated Land Strategy in common with other Local Authorities as part of the obligation defined in Section 78 B(1) of Part IIA of the Environmental Protection Act 1999.

For a considerable time Chesterfield Borough Council has acknowledged the potential problems associated with contaminated land. Indeed, even when central government policy was still at the discussion stage, the Council recognised the need to conduct comprehensive investigation of such sites prior to granting planning permission for their redevelopment³

Dealing with Contaminated Land

The Environment Act of 1995 significantly modified Part IIA of the Environmental Protection Act 1990 placing new duties on local authorities with respect to contaminated land, specifically:

78B.(1) Every local authority shall cause its area to be inspected from time to time for the purpose-

- (a) *of identifying contaminated land; and*
- (b) *of enabling the authority to decide whether any such land is land which is required to be designated as a special site.*

Defining Contaminated Land

In addition, the Act now defines contaminated land:

"Contaminated land" is any land which appears to the local authority in whose area it is situated 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*

¹ Page 6, Best Value Performance Plan 2001/2002

² Page 5 CBC Local Plan

³ Chesterfield Borough Council Local Plan (February 1996), Section 4.30, ENV19.

(b) pollution of controlled waters is being, or is likely to be, caused;

The Need for a Strategic Approach

The statutory guidance states that the Council should adopt a strategic approach to the identification of contaminated land and should:

- be rational, ordered and efficient;
- reflect the seriousness of risk and
- address the most serious sites first.

The Council's aims and objectives are, in order of priority, the protection of:

- human health;
- water resources and ecosystems;
- property and the built environment.

The Development of the Strategy

This Strategy has been developed by the Council's Environmental Health Department in conjunction with the Environmental Consultancy University of Sheffield (ECUS).

The Strategy is based around:

- A review of the current position;
- A definition of the inspection structure;
- Collection, collation and evaluation of information and
- Consultation with appropriate organisations and individuals.

The Environmental Health Department will be responsible for driving the Strategy. However, success in implementing the procedures will require close liaison between colleagues within the Borough Council and with other statutory consultees particularly the Environment Agency. Existing mechanisms for public consultation within local community forums, Economic Development Strategy and the Local Plan will provide excellent routes by which public comment will influence the strategy.

The Council's Contaminated Land Strategy will have an impact on a number of its' services and in respect of land it owns. Clearly important within the development of the strategy will be:

Partnerships

By having a clear strategy the Council will be able to demonstrate to its' partners in the local community, the Environment Agency, and other statutory consultees its' intentions for dealing with contaminated land. A clear, justifiable strategy may also enable the Council to obtain external funding to leverage remediation projects.

Economy

The Government drive for more development on brownfield sites coupled with the need to ensure that remediated sites are 'suitable for use' places the Council, through its contaminated land strategy, in an ideal position to provide developers and landowners with support and direction in undertaking remediation schemes in the Borough.

Although outside of the Part IIA regime, the information obtained through the implementation of the strategy provides to all interested parties a clear framework within which the

Council will evaluate and assess sites that may be contaminated. It will benefit all stakeholders in the local economy if these sites can be made safe and brought back into use.

Social Value

Derelict land is one indicator of social value. Dereliction and environmental contamination holds back community development, demotivating local stakeholders limiting social pride and esteem. Chesterfield Borough Council rank this social motivation alongside economic regeneration.

Natural Environment

Environmental issues are high on the current agenda, not least because in the case of environmental pollution the costs to society and the world around are so high. While the Borough of Chesterfield may not contain many protected sites, the quality of the environment is vital to natural and social fabric of the region. The Council recognises that the natural world often provides the first indicators of environmental pollution.

This Contaminated Land Strategy is important on many fronts and the Council is committed to implementing it in full in accordance with current legislation and guidance.

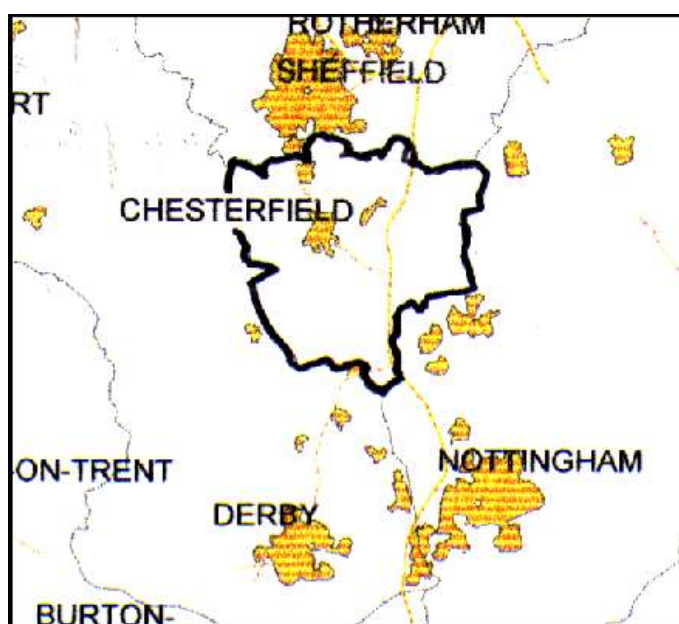
Implementation is an iterative process and the Strategy will be under constant review as more information will become available, legislation may change and guidance will be updated.

The Borough of Chesterfield

The Borough of Chesterfield includes the main urban areas of Chesterfield (the second largest town in Derbyshire), Staveley and Brimington and covers an area of 6603 hectares. The Borough is surrounded by the adjoining districts of North East Derbyshire and Bolsover. The Borough boundary is shown in a regional context in Figure 1.

The Borough has a population of just over 100,000 with a population density of 15.05 persons per hectare.

Figure 1 Chesterfield Borough in its regional context.



Geology and Hydrology

The Borough is located on an area of broad outcrop of Carboniferous, lower to middle Coal Measures strata consisting of sandstones, mudrocks, iron-stone horizons, seat earths and coal seams⁴. The variable durability and nature of the rock types the region has created a varied and undulating topography, generally ranging between 91m to 183m above ordnance datum (O.D.).

To the east of Chesterfield, beyond the line of the M1 motorway, the Coal Measures strata are bound by younger, plateau like outcrops of Permo-Triassic rocks. These are themselves bound by an escarpment of Lower Magnesian Limestone; generally these sequences are 152m to 183m above O.D. To the west of Chesterfield the Coal Measures rocks are bound by an area of high ground, which forms the eastern flank of the southern Pennines, consisting of older Carboniferous Limestone and Millstone Grit rocks, and rising to a maximum height of 366m above O.D. on Beeley Moor. The overall picture is of a Borough situated on the eastern flank of an anticline or 'dome' which, through erosion, has been dissected, exposing a sequence of rocks that are younger in age passing to the east.

⁴ Smith E.G., Rhys G.H. & Eden R.A. (1967) Memoirs of the Geological Survey of Great Britain. Geology of the Country around Chesterfield, Matlock and Mansfield. NERC, London

With the exception of minor brooks, the area to the west of Chesterfield contains the south flowing River Derwent which drains the Carboniferous limestone to the west of Chesterfield. The Coal Measures rocks are drained to the north of the area by the River Rother and its tributaries, and to the south of the area by the River Amber.

Public water supplies in Chesterfield tended to be the responsibility of the North Derbyshire Water Board whose sources were to be impounded reservoirs in the Linacre and Amber Valleys. Water supplies are also obtained from wells and boreholes in the Millstone Grit, Coal Measures and Lower Magnesium Limestone. Main water supplies are currently supplied by Severn Trent from the Derwent Valley System.

Historically the industrial importance of the area has been based on its mineral wealth, with records dating back to the middle ages of small scale coal abstraction. But it was the Coal Measures ironstone, coal, and fireclays that were largely responsible for the industrial development of Chesterfield during the eighteenth and nineteenth century. In the latter parts of the 18th century, industrial applications of coal were widened with its conversion to coke for use in the smelting of iron. The local importance of the coal industry in the early 19th century is highlighted by employment numbers which document that in 1831 nearly 50% of Chesterfield's 3000 families were employed in the extensive collieries, iron pits, clay pits etc. Subsequently these industries have declined and vanished with only the legacy of industrial dereliction and spoil heaps remaining in their wake. (see 2.13 – 2.26 below).

Land Use

Chesterfield Borough consists of mixed residential and industrial areas, with a substantial area of open countryside in the north and west of the Borough which lies within the North East Derbyshire Green Belt.

In common with much of industrialised Britain, traditional industries such as mining and manufacturing have declined leaving a legacy of dereliction.

Industrial areas are located particularly along the valley of the Rother, the Chesterfield Canal and adjacent to the railways serving the Borough.

Protected Habitats

Of the many types of protected habitats in the United Kingdom (see 5.5) only examples of ancient woodlands are found within Chesterfield's boundaries.

Key Property Types

The Borough does contain some key property types requiring special attention including Scheduled Ancient Monuments and Listed Buildings.

Water Resources

No groundwater protection zones or nitrate vulnerable areas, as designated by the Environment Agency, exist within the Borough's limits.

Current and Past Historical Industrial Uses

Coal Mining

There has been coal mining in the region since the late sixteenth century and the industry was greatly assisted by the opening of the Chesterfield Canal in 1777 linking the Borough to the River Trent; there was indeed a wharf at Lockoford Lane near Chesterfield town centre. Transport of coal by canal declined as the railways developed during the nineteenth century.

The coal and iron ore industries were closely related in the Borough with ironstone mined from the Coal Measures.

The coal industry grew rapidly throughout the eighteenth and nineteenth centuries to create the distinctive social and economic patterns within the Borough. Mining companies of all sizes developed, some of the largest being at Sheepbridge and Staveley with smaller mines located at Ashgate, Barlow and Whittington and later at Hasland, Brampton and Dunston. A second pit installed at Sheepbridge produced over 10,000 tonnes of coal per week.

Even in this era the human and environmental costs of industrialisation in the area were high. The Commissioners on the Pollution of Rivers in 1874 reported:

“huge volumes of black water fed into brooks, streams and rivers and some effects on drainage had already been noted”⁵

Iron Ore

Iron ore has been mined in the Borough for many centuries in tandem with coal. Demand was particularly high during the Napoleonic wars when cannon and cannon balls were required in huge numbers. Output from Brampton, Hasland, Wingerworth, Duckmanton and Staveley grew rapidly. The Sheepbridge Iron Works had three furnaces and later produced armour plating for warships. Demand from the railways industry was also increasing. Another iron works built at Staveley in the 1870's had eight blast furnaces and employed between 3000 and 4000 men. The site remains as a steelworks today.

Other Local Industry

The availability of coal and iron in the region led to the development of other engineering concerns including, interestingly, the manufacture of cars as a Ford Agency at the Broad Oaks Engineering Works around the time of the First World War. The site, owned by the local Markham family, also made colliery equipment. Charles Markham was responsible for building the Devonshire Works at Staveley in the early 1900's to treat coke oven by-products. The Staveley Chemicals Company went on to develop very successful sulphate, tar distillation, benzole and sulphuric acid plants that prospered throughout the twentieth century.

The Bryan Donkin Co. Ltd., another well known name in the Chesterfield area, moved to the Borough around 1903 and came to specialise in equipment for the gas industry as well as valves, motor parts, gas exhausters and reducing governors.

Coal played a major role in the establishment of another local industry, the potteries. Dating back to the fifteenth century, and possibly earlier, various works produced brown ware pottery or 'Chesterfield ware' and Bristol stoneware in potteries at Brampton, Newbold and Whittington. Other potteries were sited at Ashgate and Staveley.

In the last century two tanneries were located in Chesterfield Town Centre and gave the Tanners and Skinners Arms public house in Lordsmill Street its name.

Other industries of note include packaging and textiles. Chesterfield pioneered the use of lint in surgical dressings stimulated by demand from the Crimea War. In the mid 1800's John Bradbury Robinson also founded his famous pill-box manufacturing company at Wheat Bridge Lawn. Starting with willow boxes, his business moved on to introduce the use of cardboard in pill-boxes before diversifying into the manufacture of lint.

The area is also known for the manufacture of cotton, flax, candle-wick, lace and indeed silk which was manufactured in the first water-powered factory in Chesterfield. Several other factories opened in Wheeldon Lane and Spital, much of the lace being used in the manufacture of stockings.

At the time of printing four foundries and a glass factory (about to close) are located in the Borough.

⁵ History of Chesterfield, Volume 4, Development of the Modern Town, T.F. Wright

In common with many parts of the UK our industrial heritage has left an environmental legacy that the Council is now determined to deal with in a strategic, cost-effective manner. Many of these sites however, will also represent historical environments and conservation or recording of remains will be equally important. To this end, the Council will be working closely with English Heritage to develop appropriate assessment and remediation schemes and it is a Council objective to ensure that such sites are protected.

Council Owned Land

A number of sites within Council ownership are known to have issues of land contamination.

These include:

- Barrow Hill Engine Shed: (metals and oils)
- Barlow Brook:(iron rich mine waters)
- Smeckly Wood Close: (foundry waste)
- Sudbrook Valley: (fly tipped waste)
- Lowgates adjoining the River Doe Lea: (dioxins)
- Hall Lane: (airborne contamination)
- Clocktower riverbank: (foundry waste)
- Sheepbridge Lane: (metals and oils)
- Broombank Road: (foundry waste)
- Carrwood Road: (foundry waste)
- Foxwood Road: (foundry waste)
- Holmebrook Park: (tyres and fly tipping)
- Ireland Close: (metals and oils).

The Council currently owns over 550 properties in total located across the Borough. A list of these properties can be viewed along with the Contaminated Land Information Register in the Planning and Estates Department at the Town Hall.

Inspection Strategy Action Plan

Introduction

This Section outlines the *overall strategy* that the Council will implement to meet its obligations under the current legislation. In Section 4 more detail is provided of the procedures to be followed within the strategy. Supporting information is presented in the Appendices.

Key Objectives and Priorities

The ultimate objective of this Strategy is to facilitate an assessment of individual sites in terms of whether the land is “contaminated land” or not (as defined in the Act) and then deal with the most urgent problems to minimise risk to vulnerable receptors.

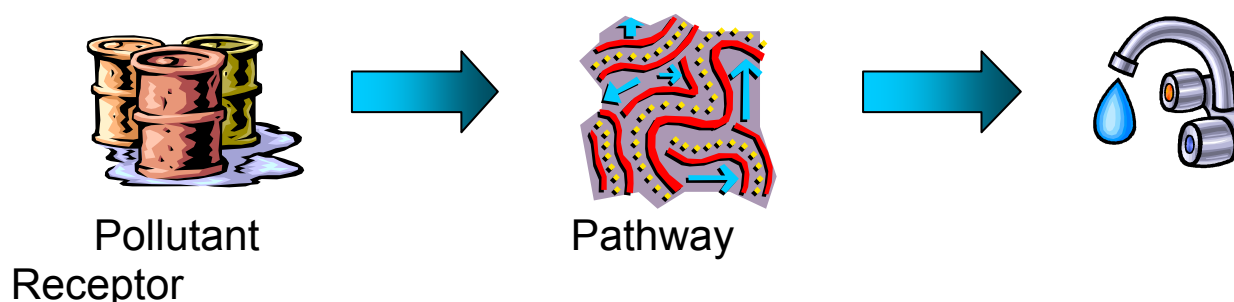
Background to Our Basic Approach – Risk Assessment

The management of contaminated land in the United Kingdom is based upon *risk assessment* – therefore, action is based on the real chances of contamination affecting people, the environment or buildings.

In assessing what risk is associated with using a site we must look firstly at how polluted the site is, and with what – what is *the Pollutant*? Next we must look at what are the vulnerable targets (*the Receptors*) – are they the current site users, the quality of the groundwater or the local river, or are there scheduled ancient monuments or important archaeology associated with the site? Finally, we must establish whether there is a way in which the Pollutant can affect the receptors (*the pathway*) – could people touch polluted soil, or drink contaminated water; could the pollution move with dust from the site, or are we growing food in polluted soil.

A *risk of harm* exists if all three elements are present (pollutant-pathway-receptor). This is termed a *pollutant linkage*. For land to be *contaminated*, as defined in the Act, then *significant* harm must be occurring or likely to occur (detailed guidance is given for the assessment of this⁶). For significant harm to occur or be likely to occur then this linkage has to be established.

Figure 2 Pollutant Linkage – an example.



As an example, leaking oil drums (*Pollutant*) stored on permeable soils and rocks (*pathway*) overlying an aquifer that provides a drinking water supply (*receptor*) would be regarded as posing a risk. If, however, one of the three elements were absent, for example, if the rocks were impermeable then the pathway would be missing and the pollutant linkage not established.

⁶ This distinction is significant and it should be noted that land which may be regarded as contaminated land under normal circumstances may not be so under the strict definition of the Act.

Once we have identified those sites where we think there is a problem how do we deal with them? In the UK we adopt a *suitable for use* approach. Basically, this means that in cleaning up an area of contaminated land we must make it suitable for whatever the land is being used for.

The Council's Procedures for Site Prioritisation and Investigation

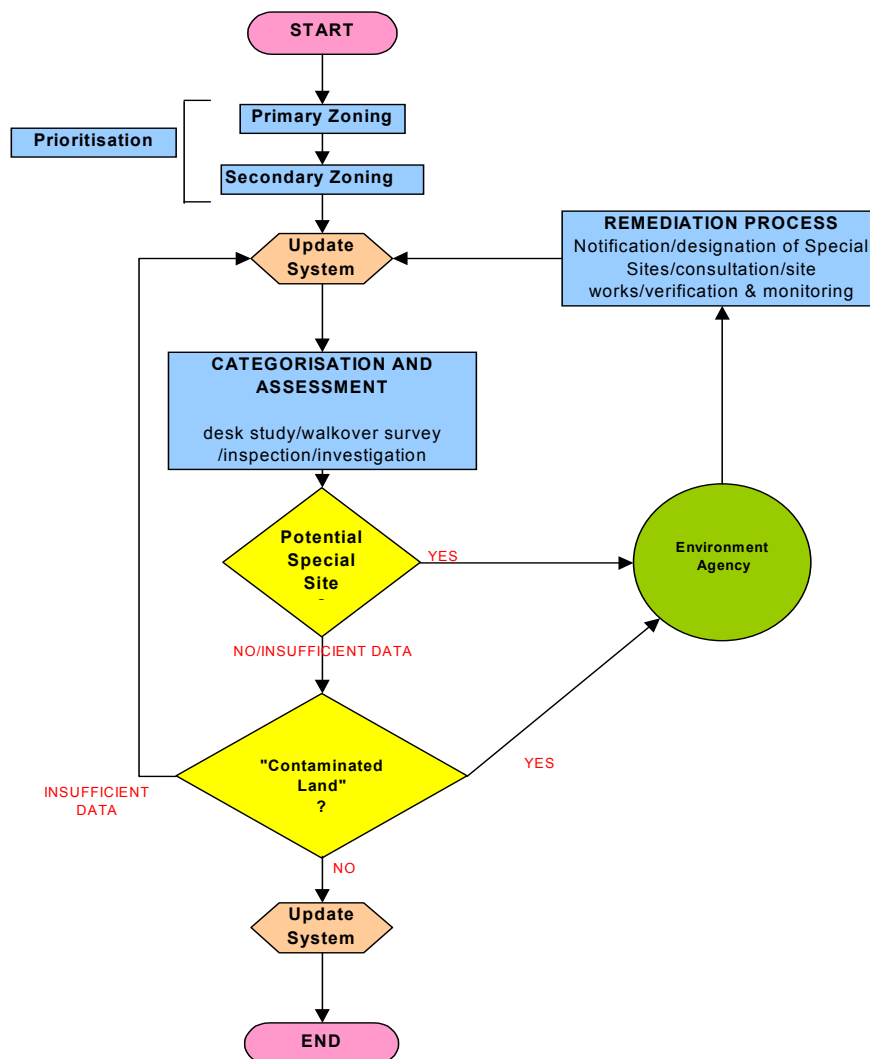
To ensure the best use of available resources without compromising effectiveness it is critical that our resources are well *targeted* and that the sites posing the greatest risk are addressed first.

The key stages in the Councils Strategy are therefore:

- Site Prioritisation;
- Site Inspection;
- Site Investigation;
- Site Remediation;
- Post Remediation Management.

A schematic representation of the overall assessment procedure is presented in Figure 3. The following sections describe how this procedure is developed.

Figure 3 Assessment Procedure.



Information Systems

The key to the whole contaminated land strategy is good information. That information comes from a wide range of sources as discussed later and the body of data will grow as the programme develops. The borough-wide information will be stored within a Geographical Information System (see Appendix 2) and forms the basis of the procedure described in Figure 3 and the paragraphs below. The basic GIS will be constructed around base maps of the Borough with other data sets from the Environment Agency and British Geological Survey for example, providing more detailed layers of information. In a feedback loop the site inspections and investigations will feed new information back into the GIS making it a comprehensive, constantly updated, easily accessible record of contaminated land in the Borough.

The procedures described in the flowchart are designed to act as a loop of repeated assessment, remediation and consultation. An exit from that loop can only be gained as and when a site is considered by the Council to be non-contaminated i.e. the pollutant linkage has been broken. The ease with which this can be done will vary from site to site and in the worst cases may require extensive remediation. Details of individual sites and their current stage in the assessment process will be stored on the GIS.

Prioritisation

Based on the interrogation of the GIS database, the Council will prioritise which areas within the Borough may need to be dealt with and in what order. The prioritisation procedure therefore serves two purposes:

- it enables a large body of information relating to the entire Borough of Chesterfield to be broken down into smaller, more manageable data sets right down to individual plots of land and;
- it allows these sites and areas to be ranked in order of the seriousness of the risk that they pose in the case of potentially contaminated sites and the level of vulnerability for areas that might contain receptors or targets.

A structured prioritisation procedure is the key to ensuring that the Council meets its obligation to deal with the sites of greatest concern at the earliest opportunity.

Figure 3 shows that prioritisation consists of a two stage *Zoning* process which divides up the Borough into areas of similar land type. This is followed by a *Categorisation* procedure which looks more closely at sites on an individual basis.

A more detailed explanation of the *prioritisation* techniques and procedures that will be used is presented in Section 4.

Categorisation

Before a site can be investigated in detail, a *site inspection* must be undertaken. *Site inspections* will be carried out concurrently with the on-going *desk based* prioritisation procedures. That is to say that *inspections* cannot wait until all sites in the Borough have been categorised as this will only serve to delay future site investigation and ultimately cleaning up those sites that require *remediation*.

It is anticipated that *site inspections* will consist essentially of a walkover survey of the site by Council staff with a review of available information and possibly some limited sampling.

The *inspection* will focus on the identification of pollutant linkages (Pollutant-pathway-receptor; see 3.3 above). Methodologies for inspection will be based upon current good practice and guidance and will reflect the nature of the site. Examples of best-practice guidance are presented in Appendix 3.

Where necessary the inspection phase of the strategy will lead into more *detailed site investigation*.

Site Investigation

This stage is likely to be undertaken by specialists and the Council will draw up a select list of consultants and contractors capable of undertaking such work (see Appendix 7). Stringent standards will be applied to selection. For instance, consultants will be required to demonstrate their experience in the field, to carry appropriate levels of insurance and be willing to enter into warranty or other agreements where appropriate.

The Council recognises that methodologies for the investigation of contaminated land are necessarily site specific for a number of reasons:

- Site uses, both current and historical, and the resultant potential contaminants vary widely;
- Different geology and surface conditions will require different on-site techniques (e.g. boreholes, trial pitting, etc);
- Different receptor groups (targets) will require appropriate assessment techniques (e.g. groundwater modelling for vulnerable aquifers, establishment of contaminant reference levels for environmental targets and exposure limits for people);
- Investigations must reflect developments in technology and not be restricted to outdated methods simply to maintain continuity of common practice.

Consultants and contractors will be expected to be familiar with the latest guidance, current examples of which are presented in Appendix 3.

A number of possible conclusions will be drawn from the *site investigation* stage:

- The risk posed to identified receptors by contamination on the site is not significant (as defined by the Act) and no further action is required;
- Further investigation or monitoring is required to make an adequate assessment;
- Some degree of *remediation* is required.

Designation of “Contaminated Land”

Although the designation of *contaminated land* may occur at any stage of the procedure, the most likely point is immediately following the *site investigation* stage.

The Council has sole responsibility for the determination of *contaminated land* in the Borough and this responsibility cannot be delegated to any other person or body.

Where land is designated as *contaminated land* the Council will:

- notify the relevant persons;
- provide a written record of the determination (in addition to information already maintained on the GIS);
- instigate *Special Site* procedures⁷ where applicable.

Remediation

Where the Councils procedures have established that a site is "Contaminated Land" a requirement for remedial action may be made. This may first be through voluntary agreement with the land owner(s) or if a site owner does not have an existing plan to remediate a contaminated site then the Council may serve a *remediation notice*. In

⁷ “Procedures” refers to internal Council protocols in respect of Special Sites. Formalised procedures for communication of information with owners, occupiers and other interested parties will be developed. Guidance on the identification of Appropriate Persons is provided in the Contaminated Land Regulations 2000.

either case a remediation strategy must be agreed with the Council. Details will be held by the Council and the GIS will be updated accordingly.

Remediation as defined in the guidance (see Appendix 1 Glossary of Terms) includes assessment and monitoring. In common parlance, remediation is the technical term used to describe the process by which the pollutant linkage is broken and in practice this often means the clean-up of contaminated land.

Where there is an imminent danger of serious harm or pollution of controlled waters, the Council can instigate *Urgent Remediation*. This is done either by issuing an *Emergency Remediation Notice* or by carrying out the remediation itself.

In issuing a remediation notice the Council must be certain as to the liable parties. There are 5 stages to follow before liability can be apportioned:

- Identify potential appropriate persons and liability groups;
- Characterise remediation actions;
- Attribute responsibility to liability groups;
- Exclude members of liability groups;
- Apportion liability between members of a liability group.

These procedures are complex and once identified the liable party may be classified as either a "Class A" or "Class B" person:

- Class A - the polluter or persons who knowingly permit pollution;
- Class B - where no class A person can be found liability reverts to the owner or occupier.

Post Remediation

In many cases post-remediation monitoring or a technical appraisal of the success of the remediation by an appropriately experienced body will be required. In assessing the effectiveness of remediation, the Council will work on the basis of "authoritative scientific and technical advice".

Sites will be remediated to a level suitable for the current use. In the event that the use of a site changes, the Council may require further remedial action to be undertaken under the Planning System.

Where appropriate, records of any post-remediation monitoring will be added to the GIS database.

Unscheduled Assessments and Triggers for Inspection

It is likely that some sites will require assessment on an *ad hoc* basis (i.e. unscheduled) and this Strategy allows this to be undertaken with the omission of the *Zoning* procedure.

Sites currently known to be polluting and regarded as urgent will be addressed as a matter of priority and will not rely on the final version of the Strategy being published or the GIS being fully operational.

Information and complaints from members of the public, businesses and voluntary organisations will be assessed on a site specific basis using the same criteria as scheduled assessments and given priority if required. Any subsequent actions will be taken on merit.

Where site uses alter, a reassessment of the site will be undertaken as part of the planning process and the Council's planning department will have full access to the contaminated land GIS. Where further action is needed under the Part IIA regime this will be undertaken accordingly.

Other triggers for a reassessment under Part IIA are:

- proposed changes in surroundings land;

- unplanned uses of the land;
- unplanned events such as flooding, accidents or landslides;
- verifiable reports of unusual site conditions;
- information from statutory bodies;
- information from owners, occupiers or other interested parties.

Special Sites

Following inspection, and where necessary investigation, the Council may designate some sites as *Special Sites*. A *Special Site* is defined as:

“any contaminated land-

- (a) which has been designated as such by virtue of section 78C(7) or 78D(6).....;and
- (b) whose designation as such has not been terminated by the appropriate Agency under section 78Q(4)

When land is designated as a *Special Site* the enforcing Authority for that land then becomes the Environment Agency rather than the Council.

Special Sites (see Appendix 1 Glossary of Terms) are likely to include sites such as waste acid tar lagoons, oil refinery sites, explosive manufacturers, former military sites, IPC sites, nuclear sites⁸ and sites where significant *pollutant linkages* are present (e.g. pollution of drinking water).

The Statutory Guidance directs the Local Authority to request that the Environment Agency undertakes inspection of potential *Special Sites* if there is evidence to suggest that the site in question is likely to be a *Special Site* following its designation as *Contaminated Land*.

Whilst the designation of a *Special Site* cannot be undertaken until the site has been formally classified as *Contaminated Land*, it is important that any potential *Special Sites* are identified at the earliest possible stage in the *Prioritisation* process.

Where the Environment Agency disagrees with the Council's designation of a *Special Site* it has twenty one days from receipt of notification to respond. In such cases any decision is likely to be referred to the Secretary of State.

Information Registers

Under the terms of Part IIA the Council will maintain a register of information drawn from the GIS. The register will be available for free inspection by the public in the Environmental Health Department at the Town Hall in Chesterfield at reasonable times and copies of data maintained on the register are also available at a reasonable cost.

Information to be contained on the register is set out in detail in Schedule 3 of the Contaminated Land Regulations 2000 and will include:

- Site Information
- Information about *Remediation*;
- Information about *Special Sites*;
- Environment Agency site specific guidance;
- Appeals against Remediation Notices;
- Appeals against Charging Notices;

⁸ For aspects of contamination not covered by other specific legislation relating to radioactivity.

- Convictions.

Information may be excluded from the register if it is considered that:

- Inclusion is against the interests of national security;
- The information is commercially confidential.

Interaction and Consultation

In some cases statutory powers other than Part IIA provisions may be applicable to particular sites. These include:

- IPC Authorisations (under Part I of the Environmental Protection Act 1990);
- Waste management licensing (under Part II of the EPA);
- Works Notices Regulations (under the Water Resources Act 1991);
- Groundwater Regulations.

Any such cases will require consultation with the relevant agencies (in the case of the examples above, the Environment Agency) before an appropriate course of action can be adopted. The Council will establish formalised procedures with the appropriate agencies to ensure efficient consultation, transfer of information and regulatory control.

The Council will liaise with appropriate agencies including:

- Environment Agency;
- English Nature;
- Countryside Agency;
- Ministry for Agriculture, Fisheries and Food;
- English Heritage (including Inspector of Ancient Monuments);
- Derbyshire County Council;
- Food Standards Agency;
- Government Office.

Internal interaction with other departments at the Borough Council will be important and access to the GIS will be available across the Councils departments.

Working Programme

The Strategy will be implemented by the Council on the timescales outlined in the working programme below.

This programme provides a general overview of key milestones. It is certain that as the work progresses, the management review mechanism (Figure 3) will rescale the work programme to relate to new information and practical experience about sensitive receptors and contaminated land within the Borough, as and when it appears.

Table 1 Working Programme

Strategy Procedure	Timescale
Publication of the strategy	June 2001
Licensing and establishing the GIS system and database to process land based information from multiples sources, facilitate prioritisation and assessment and to provide the basis for the public information register	Commissioning from July 2001 and processing data from Autumn 2001
Define procedures for enforcement action	July 2001 onwards
Dealing with urgent sites	Autumn 2001 onwards
Site identification	Autumn 2001 onwards
Desktop risk assessment	September 2001
Site inspections	April 2002
Detailed site inspection and risk assessment	Ongoing as sites are either; identified through the prioritisation and categorisation stages or as they enter the planning process for redevelopment
Enforcement Action	Ongoing as a follow on from above, where sites are found to be a significant risk to receptors

Prioritising Sites for Action

Introduction

This section describes in more detail the procedures that will drive the Strategy. Supporting information is provided in the Appendices.

The Council will use a risk assessment approach to identifying and prioritising contaminated sites. In carrying out its inspection duties, the Council is duty bound to take a strategic approach that is ordered, rational and efficient. The Council's approach must also be proportionate to the seriousness of any actual or potential risk and seek to ensure that the most pressing and serious problems are located first.

The Basis for Chesterfield's Strategy

The DETR Contaminated Land Research (CLR) Report No 6 *Prioritisation and Categorisation Procedure for Sites which may be Contaminated* provides a prioritisation procedure based on pollutant-pathway-receptor assessments using a series of simple flowcharts.

CLR 6 was chosen because;

- it is straight forward enough for non-experts to use;
- it is flexible and can be used for simple and complex sites alike;
- it can be used in conjunction with other more technical tools such as computer models and
- it is independent of technical developments i.e. it won't get out of date and can still be used as guidance is updated.

The methodology presented in CLR 6 presents an ordered, rational and efficient approach to ensuring that the Council's response is appropriate and the most pressing areas are identified for action first.

CLR 6 identifies three broadly defined receptors:

- Development (including human health, the built environment and plants);
- Surface Water and
- Groundwater.

The first step is an initial *prioritisation*. CLR 6 Part I presents this first step as a simple assessment using limited information and is based upon proximity of the site or area to receptors. Sites are classified as A, B or C in order of decreasing priority.

CLR 6 Part II *Assessment* will be used to place sites into contamination status priority categories using much more detailed information about each site. Four categories are defined:

- | | |
|-------------------|--|
| Category 1 | Site probably or certainly not suitable for present use and environmental setting.
Contaminants probably or certainly present and very likely to have an unacceptable impact on key targets.
Urgent action needed in the short term. |
| Category 2 | Site may not be suitable for present use and environmental setting.
Contaminants probably or certainly present and likely to have an unacceptable impact on key targets.
Action may be needed in the medium term. |
| Category 3 | Site considered suitable for present use and environmental setting. |

Contaminants may be present but unlikely to have an unacceptable impact on key targets.

Action unlikely to be needed whilst site remains in present use or otherwise remains undisturbed

Category 4

Site considered suitable for present use and environmental setting. Contaminants may be present but very unlikely to have an unacceptable impact on key targets.

Action unlikely to be needed whilst site remains in present use and remains undisturbed.

How These Techniques will be applied to Chesterfield Borough

The techniques presented in CLR 6 form the central system around which the Strategy for Chesterfield Borough will be operated.

To identify quickly the sites posing the greatest risk, prioritisation will consist of a two-phase *Zoning* of the Borough followed by *Priority Categorisation* where sites will be classified on an individual plot by plot basis (Figure 3).

Primary Zoning

In the first instance, the Borough will be divided into a series of *Zones* using the techniques contained within CLR No.6 Part I, *prioritisation/assessment*; that is to say zoning based upon proximity to *receptors* (see 4.3 – 4.4 above). This procedure will be undertaken using the interpretative capabilities of the GIS.

This will produce a series of areas coded in order of their priority for inspection/investigation and based on the three generic receptor types,

- Development (coded A –C),
- Groundwater (coded A –C) and
- Surface water (coded A –C)

Combining the findings for each receptor type gives an overall three letter coding for each zone; AAA zones with the highest priority for investigation because they may affect all three receptors down to CCC zones that affect non.

Secondary Zoning

Secondary zoning is based on CLR No. 6 Part II *Priority Categorisation*. This requires the use of data related to *Pollutants* (current or historical pollution) and potential *Pathways* (e.g. geology, human contact, plant uptake etc.) drawn from both desk based reviews and site inspections.

This process results in the preliminary classification of each zone or site into one of the four priority categories (see 4.5 above).

Combining both primary and secondary zoning stages results in a series of combined zones ranging from AAA,111 (highest priority) through to CCC,444 (lowest priority).

The Primary and Secondary Zoning procedures provides our first prioritised list of sites and areas. With the Borough zoned by this method, the next step will be the detailed assessment of individual sites and a more refined *Priority Categorisation* that will drive the remediation programme.

Priority Categorisation

Starting with AAA,111 zones (sites which potentially present the greatest hazard), categorisation of individual sites will be undertaken on a systematic basis with the emphasis being on the protection of human health. This will normally require some

level of site investigation (SI; see 3.21 - 3.24). Each SI will be site specific but will have the underlying principle of establishing, or disproving, that a pollutant linkage exists. This in turn allows the Council to designate the site as contaminated or otherwise.

Summary

The procedures outlined above have been developed to build up a body of information on the Borough in an ordered, rational and efficient way. By zoning the Borough, firstly according to the location of vulnerable targets, and secondly by the likely presence of pollutants, the Council can efficiently prioritise the more intensive use of resources to inspect and investigate the most serious sites.

The intimate link between the prioritisation and categorisation procedures and the GIS used for managing the data ensures that in fulfilling its inspection duties, the Council is also creating a lasting and flexible source of environmental data for the future.

Site Specific Information and Sources

Introduction

A Borough-wide Strategy such as this requires a diverse range of environmental information if it is to be comprehensive. Many local and national bodies will hold valuable data to complement that already held within the internal Departments of the Borough Council.

In establishing the GIS database, Council staff will consult with all the bodies listed below to ascertain what information is held, in what format and what would be the most efficient way of collating that information. It is recognised that new data sources will become apparent as the Strategy is implemented.

Some of these data sources, the Environment Agency for instance, have already been contacted and their data resources are known (see Appendix 4).

Internal Sources

The Authority already has use of many information sources within various Departments. These include:-

- CBC Local Plan
- Petrol Stations and Oil Tanks
- Part B Processes
- Green Belt Land
- Landfills and Quarries
- Private Water Supplies
- Scrap Metal Dealers

Aerial Photography

The Council currently possesses aerial photographs of the Borough undertaken by the Millennium Mapping Project. This is an extremely useful source of information within the GIS, for it can provide information on the sites surroundings giving an overview of the local area and verifying land usage.

The aerial photographs have also been auto-rectified to produce a digital terrain model (DTM) of the Borough, usefully illustrating altitude, slope and topography. This DTM can, for instance, be used to assess potential surface run-off of contaminant from a site.

Environment Agency

The Environment Agency provides support to Local Authorities in relation to Part IIA in the following areas:

- provision of information;
- provision of advice in relation to pollution of controlled waters;
- inspection of potential Special Sites on behalf of the Local Authority;
- formal designation of Special Sites.

Data freely available from the Environment Agency relevant to Chesterfield Borough includes water abstraction points, landfill sites (post-1974), RE compliance (major watercourses) and general quality assessments of major waterways. Such information can be used to prioritise site locations. It is important to note that no groundwater protection zones or nitrate vulnerable areas exist within the Borough's limits.

English Nature

English Nature provides free digital data on ancient woodlands, NNRs, Ramsar sites, SACs, SPAs and SSSIs (see Appendix 1). Of these only examples of ancient woodlands are found within Chesterfield's boundaries. This data source will be used to prioritise contaminated land in close proximity to ancient woodland.

Historical Data

Historical data will be used in the assessment and remediation processes in terms of both potential contamination and potential vulnerable receptors.

Historical data for the Borough will be stored in digital form on the GIS. Relevant information sifted from historical maps will be used in the assessment process. This data will either be compiled, manipulated and entered manually by the Council or purchased in a processed form from an external supplier, for example Landmark.

Also stored on the GIS will be data from the Sites and Monuments Records for the Borough held by Derbyshire County Council. Site specific data relating to archaeology, listed buildings, world heritage sites, historic parks and gardens, battlefields and conservation areas will be obtained through English Heritage.

Ordnance Survey Landline

Ordnance Survey Landline data can fulfil numerous roles. It contains information on local water features and building footprints required for site prioritisation but is also essential for defining site boundaries.

The local infrastructure (most notably the road and rail networks) will provide useful background information and assist the user's knowledge of site locations. Such information is available from the Ordnance Survey products *OSCAR* or the similar (but less detailed) *Meridian*.

Coal Authority

Liaison with the Coal Authority has revealed that data pertaining to coal mining activity is not available on a macro scale for the Borough. Although access to abandonment plans is available, these would require a good degree of technical interpretation. Identification of significant features in the initial stages will therefore rely upon historical data and current land use data. Coal mining reports are available in digital format for the assessment of individual sites.

British Geological Survey

The British Geological Survey (BGS) can supply selected 1:10 560 and 1:10 000 geological maps in digital format as well as borehole location plans. Although 'downhole' data is currently available only in hard copy, digital versions will be available within the next year.

Hydrogeological information where available, will also be purchased and stored in digital form on the GIS.

Health and Safety Executive (HSE)

The HSE can provide valuable information on the health implications of potential releases from sites that will be used in the assessment and categorisation process.

Food Standards Agency

The Food Standards Agency is able to supply data and specific advice in relation to any food safety aspects of contaminated land, for instance in the assessment of risk to human health or livestock from the ingestion of crops grown on contaminated land. It is

envisaged that such information will be used in conjunction with data obtained from **MAFF**.

The Future

This document is a starting point in the investigation and, ultimately, the effective management of contaminated land in the Borough of Chesterfield over the coming years. In common with other boroughs across the country the information gathered will be used to paint an accurate picture of some of the most significant environmental problems facing the United Kingdom today.

This is a draft document and has been sent to a number of consultees including the Environment Agency and the general public via The Derbyshire Times (Public Notice) on 31 May 2001. Comments on this document as well as any questions relating to it or to the broader issue of contaminated land in the Borough of Chesterfield are welcomed and should be addressed to The Borough Environmental Health Officer, Chesterfield Borough Council, Town Hall, Rose Hill, Chesterfield, Derbyshire, S40 1LP

The effectiveness of this Contaminated Land Strategy associated procedures will be reviewed on an annual basis. In this way, continual improvements can be made to the way the Council deals with contaminated land in the Borough.

Appendix 1: Glossary of Terms

Ancient Woodland - Land that has had continuous woodland cover since at least 1600AD and may be:

Ancient semi-natural woodland - Ancient woodland sites that have retained the native tree and shrub cover that has not been planted, although it may have been managed by coppicing or felling and allowed to regenerate naturally.

Ancient Replanted Woodland - Ancient woodland sites where the original native tree cover has been felled and replaced by planting, usually with conifers and usually this century.

Over 22,000 ancient woodland sites have been identified in England.

Aquifer - Water bearing rock.

Algorithm - a set of instructions or steps used in the solution of a problem e.g. a flowchart.

Brownfield Land - Land which has previously been used for something else, usually industrial, commercial or housing use; such sites may be abandoned or underused but need not necessarily be contaminated. Greenfield sites are those where no previous use, except perhaps agriculture or conservation or public open space, is known.

Contaminant - a substance which is in, on or under the land and which has the potential to cause harm or cause pollution to controlled waters.

Contaminated Land - *any land which appears to the local authority in whose area it is situated 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) *pollution of controlled waters is being, or is likely to be, caused.*

Controlled Waters - territorial and coastal waters, inland fresh waters and ground waters (Water Resources Act 1991).

DTM (digital terrain model) - a computer based system illustrating topography and landforms.

Geographical Information System (GIS) - a combination of elements designed to store, retrieve, manipulate, and display spatial data.

Groundwater - water occupying openings, cavities and spaces in rocks.

Groundwater Protection Zones - The Environment Agency is responsible for protecting groundwater and can designate sources of public water supply in particular as special protected zones. In these areas there is tight control over potentially polluting activities and accidental release of pollutants.

Harm - This is defined in the guidance as “harm to the health of living organisms or other interference with the ecological systems of which they form part and, in the case of man, includes harm to his property”.

Hydrogeology - the study of the geological factors relating to the planet’s waters.

Impermeable - The opposite of permeable.

Intrusive Investigation - an investigation of land (for example by exploratory investigations) which involves actions going beyond simple visual inspection of land, limited sampling or assessment of documentary evidence.

Monitoring - the making of subsequent inspections from time to time for the purpose of keeping under review the condition of land or waters.

NNR - A National Nature Reserve - is the land declared under the National Parks and Access to the Countryside Act 1949 or Wildlife and Countryside Act (1981), as amended.

Nitrate Vulnerable Zones - are areas where careful management of the use of fertilisers and manure is demanded to maintain the quality of groundwater.

Permeable - Permeable substances are substances that allow the passage of water or other liquids through them.

Pathway - one or more routes or means by, or through which a receptor:

- a. is being exposed to or affected by a contaminant, or
- b. could be so exposed or affected

Pollutant - a contaminant which forms part of the pollutant linkage.

Pollutant Linkage - the relationship between contaminant, a pathway and a receptor.

Prioritisation - the process by which information on contaminated land is divided into manageable sized "pieces" ranked in order of their seriousness.

Priority Categorisation - the stage in the prioritisation process at which individual sites are assessed.

Ramsar - - A "Ramsar site" is the land listed as a Wetland of International Importance under the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (the Ramsar Convention) 1973.

Receptor - either;

- a. a living organism, group of living organisms, an ecological system, or a piece of property which:
 - i. is listed in the statutory guidance as a receptor or
 - ii. is being, or could be, harmed, by a contaminant: or
- b. controlled waters which are being or could be, polluted by a contaminant.

Remediation - works, operations or any steps in relation to any lands or water for the purpose;

- i. of preventing or minimising or remedying or mitigating the effects of any significant harm or pollution of controlled waters or
- ii. restoring the land or waters to their former state.

Remediation Notice - defined in the Act as a notice specifying what an appropriate person is to do by way of remediation and the periods within which he is required to do each of the things so specified.

Risk - the combination of:

- i. the probability or frequency of occurrence of a defined hazard (e.g. exposure to a substance with potential to do harm) and
- ii. the magnitude (including the seriousness) of the consequences.

SAC - A Special Area of Conservation is the land designated under Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora.

Significant Harm - any harm determined to be significant in accordance with the statutory guidance.

Site Inspection - a preliminary survey of the site undertaken following prioritisation which may include a review of documentary information, a walkover survey and limited sampling. *Site Inspection* is a pre-cursor to the *Site Investigation*.

Site Investigation - the detailed assessment of a site involving extensive sampling. See intrusive investigation.

SPA - Special Protection Area is the land classified under Directive 79/409 on the Conservation of Wild Birds.

Special Site - any “contaminated land” designated as *Special Site* under the Act. Special sites are likely to include the more seriously contaminated sites and will be dealt with by the Environment Agency rather than the Council.

SSSI - A Site of Special Scientific Interest is the land notified as an SSSI under the Wildlife and Countryside Act (1981), as amended. Sites notified under the 1949 Act only are not included in the data set.

Substance - any natural substance whether in solid or liquid form or in the form of a gas or vapour.

Suitable for End Use - the premise that land should be remediated to a level consistent with the proposed use and not necessarily beyond this.

Trial Pit - a shallow excavation usually dug by a mechanical excavator from which ground conditions can be assessed and samples of contaminated waters or soils retrieved.

Zoning - the division of the Borough into prioritised areas initially based on proximity to receptors and secondly on pathways and hazards. A precursor to *Priority Categorisation*.

Appendix 2: Geographical Information Systems

A Geographical Information System or GIS is a combination of elements designed to store, retrieve, manipulate, and display spatial data (information concerning location). It is a package consisting of four basic parts:

- hardware;
- software;
- data and;
- a user.

GIS as a concept is similar to an overhead projector, with a series of transparencies laid upon it (as illustrated within Figure A).

It is possible to:-

- swap which layers are visible, changing classification schemes, modifying symbols, colours and patterns.
- zoom in and out, seeing all the information available or only the data you specify. As you examine these layers of information, relationships may become apparent.

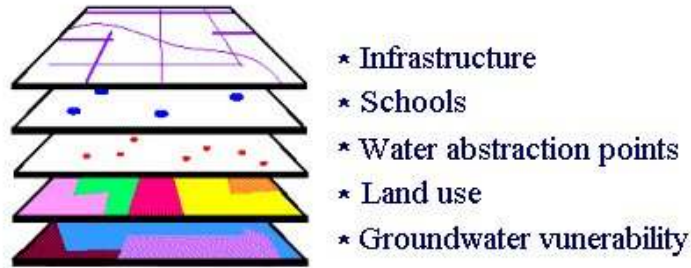


Figure A: The overhead projector analogy

The potential benefits of GIS

There are substantial advantages of a GIS over a paper map system, many of these are illustrated below:-

- Easy to share data between departments and organisations;
- Data entry is straightforward and large amounts of data can be stored;
- Possible to integrate the different data layers;
- Data is easily illustrated and visualised using maps and/or graphs;
- Complex querying of the data is possible;
- Once a system is set up it should be suitable for all members of staff to use, not just GIS specialists.

Cost savings can thus be provided due to more efficient management.

Data within GIS

Data is a fundamental component of a GIS; without data it would be impossible to create a suitable system. Digital data is now increasingly available. There may be no shortage in amounts of data itself, but a major obstacle is finding the data. The cost of numerous data sources also remains a major hindrance to many GIS's.

Geographic information (GI) can come in one of two forms: raster or vector. Examples of these are presented in Figure B.

- Raster data is the equivalent of a continuous grid covering the surface whereby each cell in the grid represents a square on the ground. Examples include satellite images, digital terrain models (DTMs – representing altitude), or scanned maps (that can be used as backdrops to add contextual information).
- The vector approach attempts to represent objects as exactly and precisely as possible by storing points, lines (arcs) and areas (polygons) in a continuous co-ordinate space.

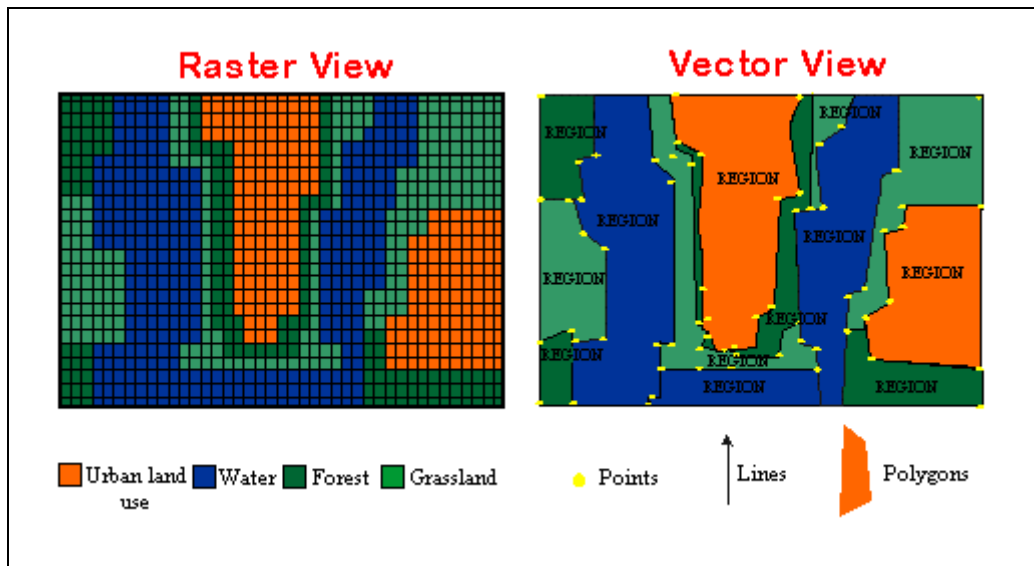


Figure B: Comparing raster and vector representations

Potential datasets

Chesterfield's contaminated land GIS will draw data from numerous sources. Contextual information such as aerial photography and infrastructure networks are required in addition to detailed land use. Sensitive areas that require higher prioritisation will be included and information on the geology and hydrology of the area is important. Historical maps are used to assist in locating possible contaminated land by analysing historical land use.

Information on some of the datasets available for Chesterfield is presented below:

Figure C: Information on selected datasets

<i>Dataset Name</i>	<i>Scale</i>	<i>Data Type</i>	<i>Supplier</i>	<i>Update</i>	<i>Available?</i>	<i>Coverage</i>
Abstraction points	unknown	point	EA	9/27/00	Y	Borough
EA internal boundaries	1:50,000	polygon	EA	5/26/99	Y	Borough
Bathing waters	unknown	point	EA	03/03/00	N/A	Borough
Water Catchment	1:50,000	polygon	EA	01/05/00	Y	Borough
GQA(Biology)	1:250,000	line	EA	10/21/99	Y	Borough
GQA(Chemistry)	1:250,000	line	EA	10/21/99	Y	Borough
RE Compliance	1:50,000	line	EA	11/01/99	Y	Borough
Landfills(post74)	1:10,000	polygon	EA	7/20/00	Y	Borough
EA Plan boundaries	1:250,000	polygon	EA	5/19/99	Y	Borough
Nitrate Vuln. Zones	1:25,000	polygon	EA	10/19/99	N/A	Borough
EA offices	1:100,000	point	EA	06/02/00	N/A	Borough
Pollution Inventory	unknown	point	EA	9/20/00	Y	Borough
Source Protection locations	1:50,000	point	EA	7/18/2000	N/A	Borough
Source Protection Zones	1:50,000	polygon	EA	07/07/00	N/A	Borough
Sewage Treatment Works	unknown	point	EA	9/25/00	Y	Borough
Consents	unknown	point	EA	8/26/00	Y	Borough
W.M Licensed sites	unknown	point	EA	8/4/00	Y	Borough
District areas	unknown	polygon	EA	unknown	Y	Borough
Ancient Woodland	1:25,000	polygon	EN	monthly	Y	100 km ² tiles
Nat. Nature Reserves (NNR)	1:10,000	polygon	EN	monthly	N/A	100 km ² tiles
Ramsar	1:10,000	polygon	EN	monthly	N/A	100 km ² tiles
SAC's	1:10,000	polygon	EN	monthly	N/A	100 km ² tiles
SPA's	1:10,000	polygon	EN	monthly	N/A	100 km ² tiles
SSSI's	1:10,000	polygon	EN	monthly	Y	100 km ² tiles
Landline	1:1,250 (urb.) 1:2,500 (rur)	point & line	OS	unknown	Y	500 m ² tiles 1 km ² tiles
Meridian 2	1:50,000	line	OS	unknown	Y	10 km ² tiles
OSCAR	n/a	line	OS	unknown	Y	5 km ² tiles
OS boundary line	1:10,000	polygon	OS	unknown	Y	25 km ² tiles
Historical maps	1:10,000 & 1:2,500	raster	L/mark	n/a	Y	unkown
Aerial photography	upto 1:2,000	raster	In house	n/a	Y	3 tiles
Local plan (2001 - 2011)	unkown	unkown	In house	n/a	Y	unkown

At the heart of any GIS system is a database that allows the spatial data to be linked to the attribute data (data that contains information about what is at a particular point). The wide range of datasets that can be housed by a GIS system is illustrated within Figure D – depicting a possible GIS database structure.

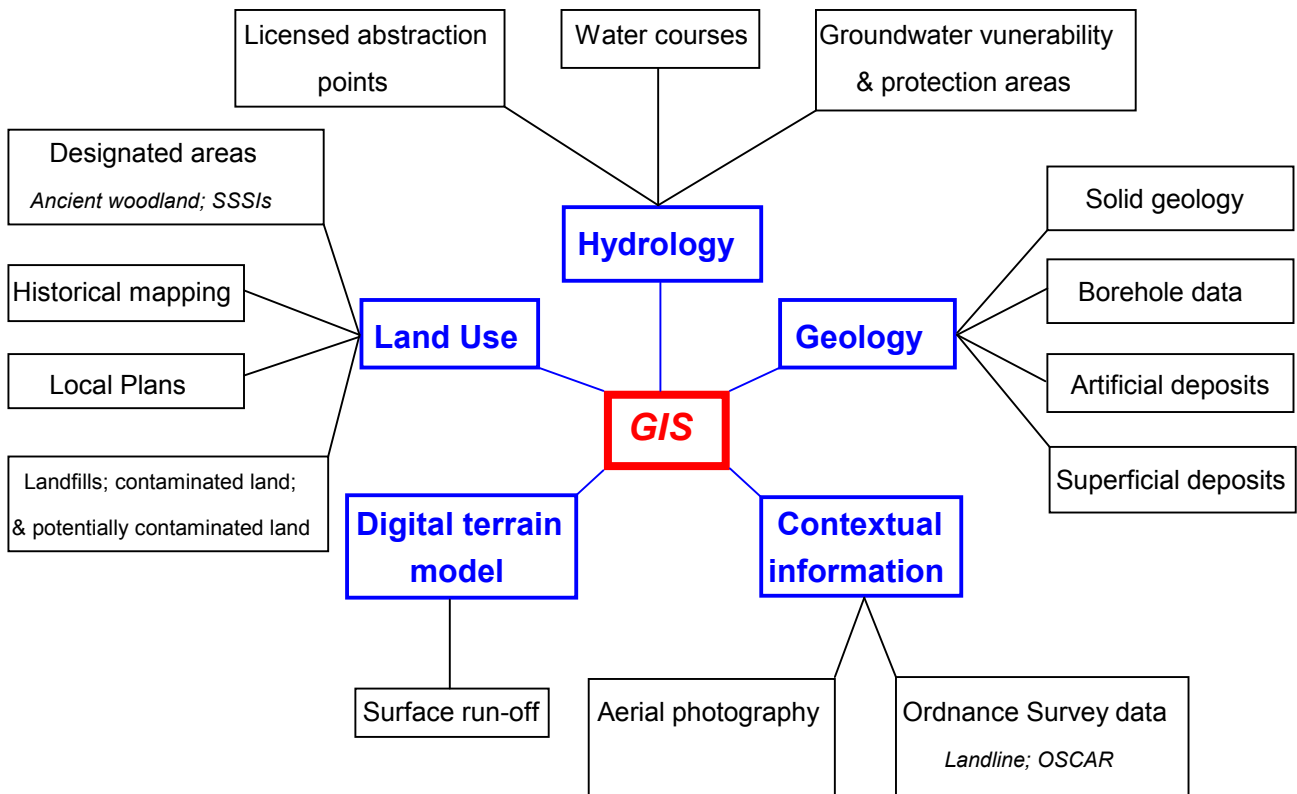


Figure D: Example of database structure

Much of the data required is already available in digital form (Figure C). However, some datasets may require data input; for instance, the location of schools.

Using the Ordnance Survey product **Address-Point**, a text-string search can be undertaken for all any words such as 'school', 'college', 'comprehensive', etc. Otherwise manual digitising (using governmental listings) would be required to locate each school within the Borough.

Obtaining data from numerous sources is essential but can lead a multitude of file types within the database. Non-compatible data formats require conversion for use. Usually the procedure is relatively straightforward but it is advisable to use common file types were possible to minimise the possible difficulties.

In the United Kingdom, British National Grid co-ordinates are usually used to identify (geo-reference) the locations for spatial data. Data in other formats (for example longitude and latitude) are easily transferable.

Data issues

It is important that issues of licensing and copyright are strictly maintained. All contractual arrangements will be fulfilled prior to the GIS being implemented. Copyright not only enables suppliers to protect their work, but also prevents misuse and repercussions for infringement are frequently extensive.

Commercially confidential material will be treated with care. Customised maps and reports produced by the GIS will be kept within the relevant copyright requirements and in accordance with the Data Protection Act.

The use of a password protection system for editing and saving the data sources as well as for entering the GIS is being considered. This will not only to assist data confidentiality and security but also help maintain data integrity.

No data is ever completely error free and many sources of error are unavoidable. Therefore, it is important within the metadata to determine the level of accuracy (or uncertainty) within each dataset.

Metadata is data about the datasets and is critical to maintaining an effective GIS. It should include such information as:

- The origin of the data source;
- When the dataset was created;
- Who created/modified it;
- Data coverage and scale;
- Accuracy and precision;
- Ownership, copyright and restrictions on use;
- Dataset file location;

GIS functionality

Using certain features within the Ordnance Survey product Landline it is possible to determine land curtilage (total coverage of the site). The boundary can be sketched within the GIS to create a polygon, to which attribute data can then be linked.

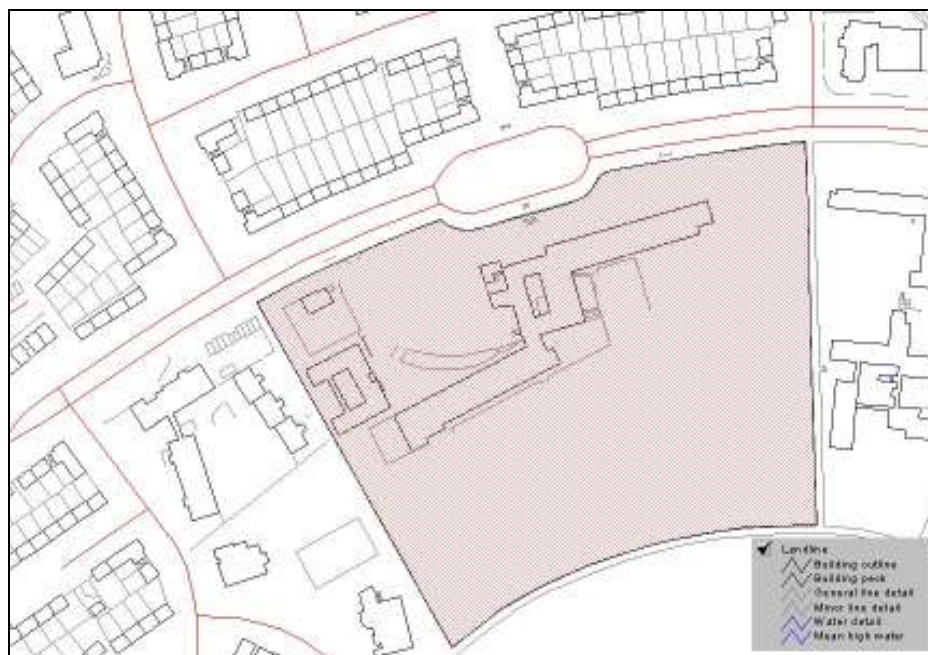


Figure E: Example of a polygonised site using Landline information

Any features within the GIS, including point sources (such as schools), lines (e.g. water courses) or polygons (such as land use) can be selected and have 'buffers' drawn around them at selected distances. This functionality is crucial for determining which locations lie within critical threshold distances of receptors (required for *Prioritisation*).

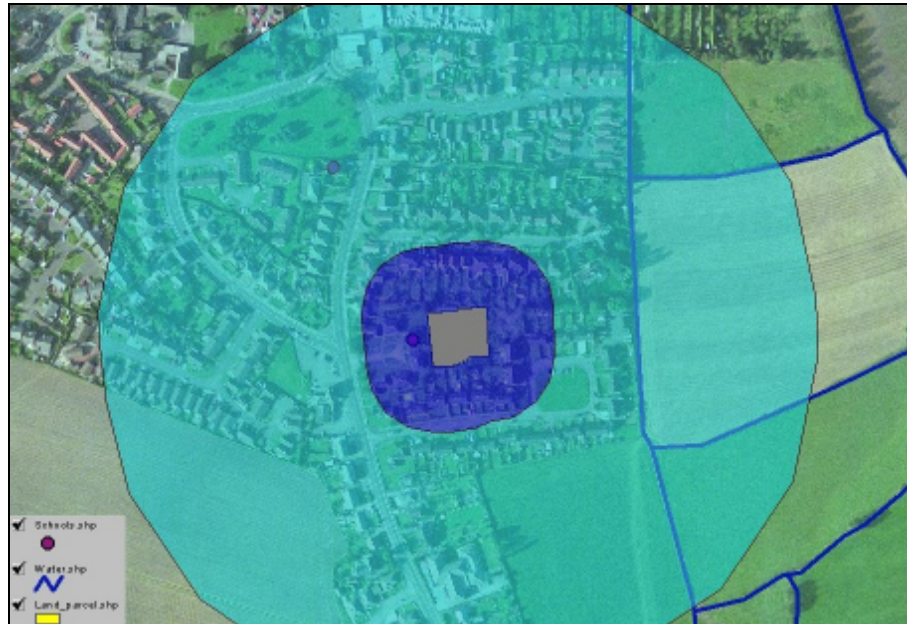


Figure F: A sample site buffered at 50 and 200 metres

Using a Digital Terrain Model (DTM), illustrating elevation, for the area it is possible to determine the potential surface run-off of any contaminant. This process will be extremely useful for prioritising a site if close to a sensitive area. It may also be possible to reverse the run-off procedure to determine liability of contamination if the source has origins off site and is not immediately obvious.



Figure G: An example of the possible surface run off from a sample site

Appendix 3: References and Guidance

A. References

1. BSI: *Code of practice for the identification of potentially contaminated land and its investigation*. Draft for Development, DD175: 1988
2. Welsh Development Agency (WDA):
3. Contaminated land Research Report No1 *A framework for assessing the impact of contaminated land on groundwater and surface water* DETR 1994
4. Contaminated land Research Report No 2: *Guidance on preliminary site inspection of contaminated land*, DETR 1994
5. Contaminated land Research Report No 3: *Documentary Research on Industrial Sites*, DETR 1994
6. Contaminated land Research Report No 4: *Sampling strategies for contaminated land*. DETR 1994
7. Contaminated land Research Report No 5 *Information systems for land contamination*. DETR 1994
8. Contaminated land Research Report No 6: *Prioritisation and categorisation procedure for sites which may be contaminated*. DETR 1995

9. Contaminated land Research Report No12: *A quality approach for contaminated land consultancy*. DETR 1997
10. *DETR Industry Profiles: (various titles)*
11. BS5930
12. The Environment Act 1995;
13. Chesterfield Borough Local Plan, February 1996, Chesterfield B.C.
14. Contaminated Land: *Implementation of Part IIA of the Environmental Protection Act 1990*: DETR Sept 1999.
15. *Some Guidance on the use of digital environmental data*, BGS/Environment Agency, March 2000
16. *Contaminated Land Inspection Strategies, Technical advice for local Authorities*; Draft for comment, DETR, April 2000
17. SI 2000/227, Environmental Protection, England: *The contaminated Land Regulations 2000*.
18. HSE: *Protection of workers and the general public during the development of Contaminated land*.1991
19. Interdepartmental Committee for the Redevelopment of Contaminated Land, ICRCCL 59/83 *Guidance on the assessment and redevelopment of contaminated land*. 2nd ed, July 1987
20. ICRCCL 17/78 *Notes on the development and after-use of landfill sites*. 8th ed, December 1990.
21. ICRCCL 18/79 *Notes on the redevelopment of gasworks sites*. 5th ed, April 1986.
22. ICRCCL 23/79 *Notes on the redevelopment of sewage works and farms*. 2nd ed, November 1983.
23. ICRCCL 42/80 *Notes on the redevelopment of scrap yards and similar sites*. 2nd ed, October 1983.
24. ICRCCL 61/84 *Notes on the fire hazards of contaminated land*. 2nd ed, July 1986.
25. ICRCCL 64/85 *Asbestos on contaminated sites*. 2nd ed, October 1990.
26. ICRCCL 70/90 *Notes on the restoration and aftercare of metalliferous mining sites for pasture and grazing*. 1st ed, February 1990.

B. Guidance

Guidance containing useful Generic and Comparative Reference Levels

ICRCCL 59/83

CLEA

Waste Management Paper No. 27: *Landfill gas*: DETR 1989

Waste Management Paper No. 26: *Landfilling Wastes Annex 2, The Control of Landfill Gas*. DETR 1986

WMP's (gas)

Netherlands Soil Analysis Task Force: "New Dutch List";

CLR Report No1 *Framework for assessing the impact of contaminated land on groundwater and surface water*, Table A2.1; EC.

BRE Digest 343: Sulphate and the acid resistance of concrete in the ground, July 1991.

The Surface Waters (Fishlife)(Classification) Regulations NO 1331 1997.

Surface Waters (Abstraction for Drinking Water) (Classification) Regulations No 3001,1996.

Surface Waters (River Ecosystem) (Classification) Regulations No. 1057, 1994.

Methodology for the derivation of remedial targets for soil and groundwater to protect water resources: E.A. R&D Publication 20 (2000)

Appendix 4: Environmental Data Sets Available

Dataset Name	Filename (mi)	Scale	Data Type	Supplier	Last Updated	Present for Chesterfield
Abstraction point locations	abstractions.tab	unknown	point	EA	27/09/2000	Yes
EA internal boundaries	areapf_50k.tab	1:50,000	polygon	EA	26/05/1999	Yes
Bathing water designations	bathing_waters.tab	unknown	point	EA	03/03/2000	N/A
Catchment boundaries	catchment_50k.tab	1:50,000	polygon	EA	05/01/2000	Yes
General Quality Assessment (Biology)	gqabiol_250k.tab	1:250,000	polyline	EA	21/10/1999	Yes
General Quality Assessment (Chemistry)	gqachem_250k.tab	1:250,000	polyline	EA	21/10/1999	Yes
RE Compliance	recomp_50k.tab	1:50,000	polyline	EA	01/11/1999	Yes
Post 1974 operational/non-operational landfills	landfill.tab	1:10,000	polygon	EA	20/07/2000	Yes
Local Environment Agency Plan boundaries	leaps_250k.tab	1:250,000	polygon	EA	19/05/1999	Yes
Nitrate Vulnerable Zones	nvz_25k.tab	1:25,000	polygon	EA	19/10/1999	N/A
EA offices & contact details	offices_100k.tab	1:100,000	point	EA	02/06/2000	N/A
Pollution Inventory	pollution_inventory.tab	unknown	point	EA	20/09/2000	Yes
Source Protection locations	source_protection_locations_50k.tab	1:50,000	point	EA	18/07/2000	N/A
Source Protection Zones	source_protection_zones_50k.tab	1:50,000	polygon	EA	07/07/2000	N/A
Licensed Sewage Treatment Works locations	stw.tab	unknown	point	EA	25/09/2000	Yes
Consent locations (Northumbria area only)	wra91consents.tab	unknown	point	EA	11/07/2000	N/A
Consent locations	discharges.tab	unknown	point	EA	26/08/2000	Yes
Waste Management Licensed sites	wml.tab	unknown	point	EA	04/08/2000	Yes
District areas	districts	unknown	polygon	EA	unknown	Yes
Ancient Woodland	ancientwoodland	1:25,000	polygon	EN	monthly	Yes
National Nature		1:10,000	polygon	EN	monthly	N/A

Reserves
(NNR)

Ramsar		1:10,000	polygon	EN	monthly	N/A
Special Area of Construction (SAC)		1:10,000	polygon	EN	monthly	N/A
Special Protection Area (SPA)		1:10,000	polygon	EN	monthly	N/A
Site of Special Scientific Interest (SSSIS)	SSSIS	1:10,000	polygon	EN	monthly	Yes

Appendix 5: Contamination Standards

1. ICRCCL 59/83

(Interdepartmental Committee on the Redevelopment of Contaminated Land)

These standards are based on the *suitable for use approach*, which the government has defined as requiring remedial action, only where: -

- the contamination poses unacceptable or potential risks to health or the environment; and
- there are appropriate and cost-effective means available, taking into account the actual or intended use of the site.

Therefore, the condition of the site must be assessed in the context of a specific future use.

The guidelines are presented in the form of *Threshold Trigger Concentration Values* (TTC's) and, for some substances, as *Action Trigger Concentration Values* (ATC's) for the following general land uses:

- domestic gardens, allotments
- playing fields, open space
- areas where plants are to be grown, landscape areas
- buildings, hardcover.

The main limitations of these guidelines are:

- i. they cover only a limited range of contaminants;
- ii. there are no TTC or ATC values for organic substances (other than common gasworks contaminants);
- iii. there are no ATC values for metals; and
- iv. the values are not applicable to the assessment of risks to the water environment.

2. The Dutch Intervention Standards

These are perhaps the most commonly used standard throughout the UK and were first published by the Dutch government in 1983 and revised in 1994. The standards now take form of an intervention level above which remediation is considered essential and a target level to be achieved after remediation. The target levels are set on the principle of multifunctionality, which is now defined as achieving the level necessary "*to restore the functional properties of the ground for human beings, flora and fauna*". These standards are far more comprehensive than any other lists but are uncertain of their legal standings in the UK.

3. The Kelly Indices

These standards were developed by the Greater London Council, for redeveloping former gas works sites in London, *as an aid to categorising soils excavated from contaminated redevelopment sites for off-site disposal purposes*. As such they are really a means of classifying the contamination status of waste. Although the standards are more comprehensive than ICRCCL 59/83 they do not give as much detail as the Dutch Standards. These guidelines are not intended to be used to assess the human health or environmental risks, which may be associated with contaminated sites.

4. Other Standards

Other standards, which are in use, are:

- Environment Agency (EA) Leachability Trigger Levels
- Building Research Establishment. Sulfate and acid resistance of concrete in the ground. Garston, UK: Digest 363, 1996.
- United States Environmental Protection Agency, Office of Solid Waste and Emergency Response, December 1994, Soil Screening Guidance.
- Waste Management Paper No. 27: *Landfill Gas*: DETR 2nd Edition 1991
- Netherlands Soil Analysis Task Force: "New Dutch List";
- Contaminated Land Report (CLR) No1 *Framework for assessing the impact of contaminated land on groundwater and surface water*, Table A2.1; EC.
- *The Surface Waters* (Fishlife)(Classification) Regulations N0 1331 1997.
- *Surface Waters (Abstraction for Drinking Water)* (Classification) Regulations No 3001,1996.
- *Surface Waters (River Ecosystem)* (Classification) Regulations No. 1057, 1994.
- Methodology for the derivation of remedial targets for soil and groundwater to protect water resources: Environment Agency R&D Publication 20 (2000).

Further details of these standards can be found in CLR Report No. 12 – A Quality Approach to Contaminated Land Consultancy.

Appendix 6: List of Consultees

Tom Moat
Team Manager
English Nature
Peak District & Derbyshire Team
Manor Barn, Over Haddon
Bakewell
Derbyshire DE45 1JE

Sharon Allen
Emergency Section
Ministry of Agriculture, Fisheries & Food
East Midlands Regional Service Centre
Government Buildings
Block 7, Chalfont Drive
Nottingham NG8 3SN

Dr Patrick Miller
Contaminants Division
Food Standards Agency
Room 238 Ergon House
17 Smith Square
PO Box 31037
London SW1P 3WG

Ian Spencer
Waste Management
Environmental Services Department
Derbyshire County Council
County Hall
Matlock
Derbyshire DE4 3AH

Simon Redding
Friends of the Earth
109 Ashgate Road
Chesterfield
Derbyshire
S40 4AH

Jon Humble
English Heritage
East Midlands Region
44 Deringate
Northampton
NN1 1SR

Malcolm Lowe
Land Quality Team Leader
DEFRA
3/B5 Ashdown House
123 Victoria Street
London
SW1E 6DE

Roger Wilde
Environment Agency
Bowbridge Close
Broadmarsh Business Park
Templeborough
Rotherham
South Yorkshire S60 1BY

Clare Bates
Area Contaminated Land Officer
Environment Agency
Trentside Offices
Scarrington Road
West Bridgford
Nottingham NG2 5FA

Richard Kirk
Director of Environmental Health
North East Derbyshire District Council
Council House
Saltergate
Chesterfield
Derbyshire S40 1LF

Steve Bidwell
Chief Environmental Health & Housing Officer
District of Bolsover
Sherwood Lodge
Bolsover
Chesterfield
Derbyshire S44 6NF

Mrs Glennis Goucher
Chief Executive
Chamber of Commerce
Commerce Centre
Canal Wharf
Chesterfield
Derbyshire S41 7NA

Charlotte Harper
Environmental Planning
Severn Trent Water Limited
Severn Trent Headquarters
2297 Coventry Road
Birmingham
B26 3PU

Chesterfield Borough Council
M B Kennedy
Borough Planning & Estates Officer
J Moore
Economic Development Officer
D R Shaw
Town Clerk & Chief Executive

Town Hall,
Rose Hill
Chesterfield

Appendix 7: Select List of Contractors

AEA Technology PLC
National Environmental Technology Centre
Culham, Abingdon, Oxfordshire, OX14 3BD

BCRA Scientific and Technical Services Limited
Mill Lane, Wingerworth, Chesterfield.
Tel: 01246 209654

C L Associates
Prospect House, Prospect Road, Halesowen, Birmingham, B62 8DU
Tel: 0121 585 6959

ECUS
Endcliffe Holt, 343 Fulwood Road, Sheffield, S10 3BQ
Tel: 0114 266 9292

Enviro Technology Services PLC
Environment House, Dudbridge House, Stroud, Gloucestershire, GL5 3EE
Tel: 01453 751641

Francis H. Baker and Associates
34 Hallowes Rise, Dronfield, Derbyshire, S18 6YR
Tel: 01246 411791

National Occupational Hygiene Service
Chesterfield Small Business Centre
Pottery Lane West, Whittington Moor, Chesterfield
Tel: 01246 550099