

# **THE HIGHLAND COUNCIL**

**PROTECTIVE SERVICES**

## **Contaminated Land Inspection Strategy**

**October 2001**

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# **1. Introduction**

## **1.1 Summary**

- 1.1.1 This document sets out an inspection strategy to be adopted by The Highland Council in carrying out its responsibilities in terms of the contaminated land regime, brought into force with the Contaminated Land (Scotland) Regulations 2000. It is presented in three parts and represents an ordered and rational approach.
- 1.1.2 The first part is an introduction to the contaminated land regime. In a series of sections it provides a background to the legislation. It outlines the aims of the Scottish Executive in relation to sustainable development, which underpins the regime. It also identifies those corporate objectives of The Highland Council, arising from its goals and values, which have a direct bearing on land and development of the strategy. The relationship of existing Council plans, policies and partnerships to the development of the strategy is also discussed.
- 1.1.3 The remaining sections within this part summarise important elements of the regulations and guidance outlining the definition of contaminated land, the regulatory context and requirements for a public register of contaminated land.
- 1.1.4 The second part of the strategy highlights the characteristics of The Highland Council area, which have important implications for development of the strategy. The first sections outline The Highland Council's location and geography, its history and its general geology. Further sections summarise important aspects of the area's communities, economy, land, water environment and ecology.
- 1.1.5 The final part of the document brings together a number of themes, indicating how Highland Council is actually going to perform its duties in terms of strategy development and implementation. It outlines the council's aims and objectives, establishes internal procedures and identifies sources of information. It describes how information gathered in the collation process will be managed and considers important potential sources, pathways, receptors and sources of information. It identifies priorities and procedures for prioritisation of inspection within the context of pollutant linkage. Further sections describe essential communications, and timescales and review considerations within the regime.
- 1.1.6 A glossary, reference section and series of appendices containing supporting information relevant to the strategy are contained at the end of the document.

## **1.2 Background to the legislation**

- 1.2.1 The pollution of soils and ground water is a legacy of historical industrialisation. Pollutants arising from industrial processes, the manufacture, use and storage of chemicals, mining, waste disposal and some agricultural activities, have historically been allowed to escape onto and into land and waterways. The consequence of this has been the degradation of land quality in areas of industry and waste disposal. Such degradation has not only led to some land being unsatisfactory for further use or development, but may have also resulted in the current use of land being unsuitable, where the problem has gone unrecognised. This legacy is commonly known as “contaminated land”, and following a series of high profile incidents, particularly in the 1970’s and 80’s, which highlighted the hazards of contaminated land, the phenomenon became both an economic and environmental issue.
- 1.2.2 Concerns regarding contaminated land range from its adverse effects on human health, property, the water environment and ecosystems, to issues of development and the reuse of brownfield sites. Recognising the importance of contaminated land issues, successive governments have supported research, development and regulation in this field. Although provision was made for the contaminated land regime in the Environmental Protection Act 1990, it took a further 10 years for these to come into effect through the Contaminated Land (Scotland) Regulations. During that period the contaminated land regime was the subject of extensive consultation.

## **1.3 Objectives of the Regime**

- 1.3.1 The Scottish Executive aims to maintain the quality of land in Scotland and to progressively regenerate land where it has been degraded in the past. It is determined to limit green-field development and to favour the reuse of derelict and vacant land.
- 1.3.2 The Scottish Executive has identified contaminated land as an example of a failure of our society to move towards sustainable development. In its statement of policy on sustainable development (Scottish Executive Rural Affairs Department (SERAD) Circular 1/2000) the Scottish Executive identifies a two pronged approach to dealing with this issue. Firstly it highlights its priority to prevent the creation of new contaminated land, through regulation and licensing. Secondly, by addressing the historical legacy, it aims to deal with land already contaminated.

1.3.3 With regard to the historical legacy and in the context of sustainable development the Scottish Executive describes its objectives thus:

- to identify and remove unacceptable risks to human health and the environment;
- to seek to bring damaged land back into beneficial use; and
- to seek to ensure that the cost burdens faced by individuals, companies and society as a whole are proportionate, manageable and economically sustainable.

1.3.4 These objectives underlie the “suitable for use” approach of the regime. This approach focuses on the assessment of risks on a site-by-site basis, and consists of three elements:

- ensuring that land is suitable for its current use;
- ensuring that land is made suitable for any new use, as planning permission is given for that new use, and;
- limiting requirements for remediation to the work necessary to prevent unacceptable risks to human health or the environment in relation to the current use or future use of the land for which planning permission is being sought.

1.3.5 The Scottish Executive proposes three specific ways to overcome the potential obstacles to the redevelopment of land affected by contamination, by:

- providing public subsidy (funding is made available through Scottish Enterprise and the local enterprise network to support site redevelopment costs for projects aimed at particular social and economic regeneration objectives);
- promoting research and development, and;
- providing an appropriate policy and legal framework.

1.3.6 The new contaminated land regime provides the appropriate policy and legal framework for local authorities to deal with the historical legacy of contaminated sites. The main objective underlying the introduction of the new regime is to provide an improved system for the identification and remediation of land where contamination is causing unacceptable risks to human health or the wider environment, assessed in the context of the current use and circumstances of the land. This objective incorporates a number of components:

- to improve the focus and transparency of the controls, ensuring authorities take a strategic approach to the problems of land contamination;

- to enable all problems resulting from land contamination to be handled as part of the same regulatory process;
- to increase the consistency of approach taken by different authorities; and
- to provide a more tailored regulatory mechanism, including liability rules, better able to reflect the complexity and range of circumstances found on individual sites.

1.3.7 An important secondary objective in the implementation of the regime is the encouragement of voluntary remediation. The Scottish Executive considers that the improved clarity and consistency of the new regime will facilitate this objective.

## 1.4 Corporate Objectives

1.4.1 The Highland Council has described its strategic goals and values (The Highland Council Strategic Goals and Values 1996). Those, which have a direct bearing on the implementation of the contaminated land regime, and on regeneration of previously developed sites and sustainable land use are as follows:

Goal *“to sustain, develop and regenerate Highland communities by encouraging the careful utilisation of our natural resources and by supporting the creation of economic prosperity in environmentally sustainable ways”*

Goal *“to ensure the natural environment of the Highlands is sustained and enhanced as a basis for the wellbeing of future generations”*

Value *“we will act in ways which are environmentally sustainable in the provision of our services”*

Value *“we will display openness in our decision making and provide visibility to our decision making”*

Value *“we will embrace the principle of subsidiarity by pushing out to the most practical level nearest to the citizen, managerial and political decision making”*

Value *“we will endeavour to develop common cause with other agencies, organisations and individuals and to form partnerships with others to achieve our objectives wherever necessary, seeking to secure from other agencies resources to help implement the councils objectives”*



- 1.4.2 Strategic policies of The Highland Council are set out within the council's Structure Plan (The Highland Council Structure Plan 2001). The Highland Council Structure Plan aims to create a shared vision of how people in the Highlands can work together to develop a prosperous future, strong communities and a healthy environment. Importantly, the Structure Plan aims to influence policy not only on issues of land use planning, but in all spheres of council service provision. As a corporate document the Structure Plan provides a framework which allows the Council to make an active contribution to achieving the aim of sustainable development.
- 1.4.3 The Plan highlights a number of strategic issues and presents a vision founded on three interdependent principles of sustainable development. It identifies sustainable objectives, which will directly interact and influence the implementation of the contaminated land regime. A number of these are highlighted in the section on characteristics of the area.
- 1.4.4 Within the broader context of the community of the Highlands, The Highland Council supports a partnership approach to policy formulation. Importantly this is reflected in The Community Plan for Highland, a policy document, which charts the future of Highland for the next 20 years and beyond. 6 key public partners within the "Wellbeing Alliance" as well as representatives from the voluntary sector support the Community Plan.
- 1.4.5 The Wellbeing Alliance recognises that the Highlands' widely acclaimed environmental quality is one of the area's key economic and social assets, and attributes the value of a high quality environment, in attracting inward investment for primary industries and energy supply, tourism, and recreation.
- 1.4.6 A primary policy objective of the Community Plan is "strong and safe communities" and further, at the heart of the plan is a commitment to sustainable development. Highland Wellbeing partners have agreed that they should jointly support Local Agenda 21 (a vehicle to achieving sustainable development), and that the Community Plan represents a local strategy to deliver this. Within this context, the contaminated land regime has an important complementary role, and by helping protect public health and environmental quality will make a significant contribution to these policy objectives.
- 1.4.7 The Highland Council and Protective Services will address the contaminated land regime within the broader context of sustainable development, and will implement its strategic response in accordance with the Councils existing policy, for example those regarding: standards of service, Health & Safety, the Enforcement Concordat, RIP(S)A, Human Rights Act etc.

## 1.5 Definition of Contaminated Land

1.5.1 Contaminated land is defined in the Environmental Protection Act 1990 (EPA), S78A (2) as;

“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 ....”

1.5.2 This definition of contaminated land is based upon the principles of risk assessment, which requires that a pollutant linkage is identified and the significance of this linkage is assessed.

1.5.3 The principles of risk assessment are fundamental to the definition of contaminated land. Risk is considered for the purposes of statutory guidance (SERAD Circular 1/2000) as a combination of:

*(a) the probability, or frequency, of occurrence of a defined hazard (for example, exposure to a property of a substance with the potential to cause harm); and*

*(b) the magnitude (including the seriousness) of the consequences.*

1.5.4 The assessment of risk at specific sites, within the context of the contaminated land regime, will rely on the use of risk assessment methodologies. There are a number of risk assessment models available, which address specific receptors. Further development of models for use within the regime is anticipated. Target or guideline values used in such assessments require to be risk based. The use of generic levels in assessing land contamination is not appropriate.

1.5.5 A pollutant linkage requires the connection between a source of contamination and a receptor by means of a pathway. Receptors for the purposes of this regime are prescribed in Chapter A of the Statutory Guidance on the Definition of Contaminated Land to Annex 3 of the SERAD Circular 1/2000

1.5.6 Within this definition of contaminated land the significance of such a linkage must be assessed against the categories of significant harm, significant possibility of significant harm and pollution of controlled water. Descriptions of these are provided in Chapter A of the Statutory Guidance on the Definition of Contaminated Land, SERAD Circular 1/2000.

1.5.7 Tables from this guidance are reproduced in Appendices I & II, for reference and information.

- 1.5.8 From this definition it can be clearly seen that the regime is targeted at those sites which give rise to serious risk to human health, property, the environment or controlled waters, rather than all land which is subject to contamination.
- 1.5.9 This Strategy will principally seek to address issues of land contamination, which come within this statutory definition, in addition elements of the strategy may be applicable to consideration of land contamination within other service functions of the Council.

## **1.6 Regulatory Context**

### **1.6.1 Local Authorities**

1.6.1.1 Local authorities have the primary regulatory role within the regime. Highland Council will be responsible for:

- developing and publishing a strategy for the inspection of land within its area.
- inspecting its area to identify sites falling within the definition of contaminated land.
- determining such sites as contaminated land and, where appropriate, “special sites”.
- acting as the enforcing authority for sites identified as contaminated land which are not designated as special sites (SEPA will act as enforcing authority for special sites).
- establishing who should bear responsibility for the remediation of sites determined as contaminated land.
- deciding on remediation measures required and ensuring that such remediation is undertaken, either by agreement or where necessary by serving a remediation notice. Under certain circumstances it may be necessary for the Council to carry out the remediation works itself.
- apportionment of costs of works either subject to notice, or carried out by the Council, depending on liability.
- to record certain prescribed information about their regulatory actions on a public register.

1.6.1.2 The responsibility for the regulatory role within The Highland Council will rest essentially with the Principal Protective Services Officer (Contaminated Land) based at Protective Services, Glenurquhart Road, Inverness. This Officer will co-

ordinate the development and implementation of the Councils strategic response to the contaminated land regime, oversee the development of internal procedures, and chair the Councils (Officers) Contaminated Land Working Group.

1.6.1.3 In carrying out its responsibilities, the Council will be required to consult and liaise with organisations and individuals including other regulatory bodies, organisations representing special interests, and individuals who are site owners, appropriate persons or members of the public.

1.6.1.4 The Highland Council will adopt formal liaison procedures as necessary and will endeavour to progress remediation of sites through agreement. Responses to enquiries will, as far as possible, be comprehensive and in making decisions the Council will reflect its strategic responsibilities and display openness and transparency.

## 1.6.2 SEPA

1.6.2.1 SEPA have an important complementary regulatory role within the contaminated land regime, and have responsibilities, which include:

- providing local authorities with assistance and advice in identifying contaminated land, including site specific guidance.
- acting as the enforcing authority for any land designated as a special site.
- preparation and publication of the state of contaminated land report.

1.6.2.2 In carrying out its responsibility for preparing and publishing the state of contaminated land report SEPA will require information from local authorities on their activities within the contaminated land regime. Liaison between the council and SEPA will determine the extent and nature of such information.

1.6.2.3 Land can only be designated a special site once it has been identified as contaminated land by the local authority. Local authorities by virtue of prescribed land use can designate as special sites, contaminated land, which is associated with the following:

- certain pollution of controlled waters.
- certain prescribed families and groups of substances.
- waste acid tars.
- refining and purification of oils and petroleum
- prescribed processes designated for central control
- manufacture of explosives
- nuclear sites
- Ministry of Defence land
- manufacture, production and disposal of weapons

1.6.2.4 This represents a summary of the provisions of Regulations 2 and 3, with Schedule 1 of the Contaminated Land (Scotland) Regulations 2000.

1.6.2.5 Such land where identified in strategy implementation will be considered for designation in consultation with SEPA.

1.6.2.6 It is not necessarily the case that special sites represent the most severely contaminated sites, rather that SEPA is best placed to be the enforcing authority. Sites may also be assigned special site status on the basis of duality of control (SERAD Circular 1/2000 Annex 4)

## **1.7 Registers**

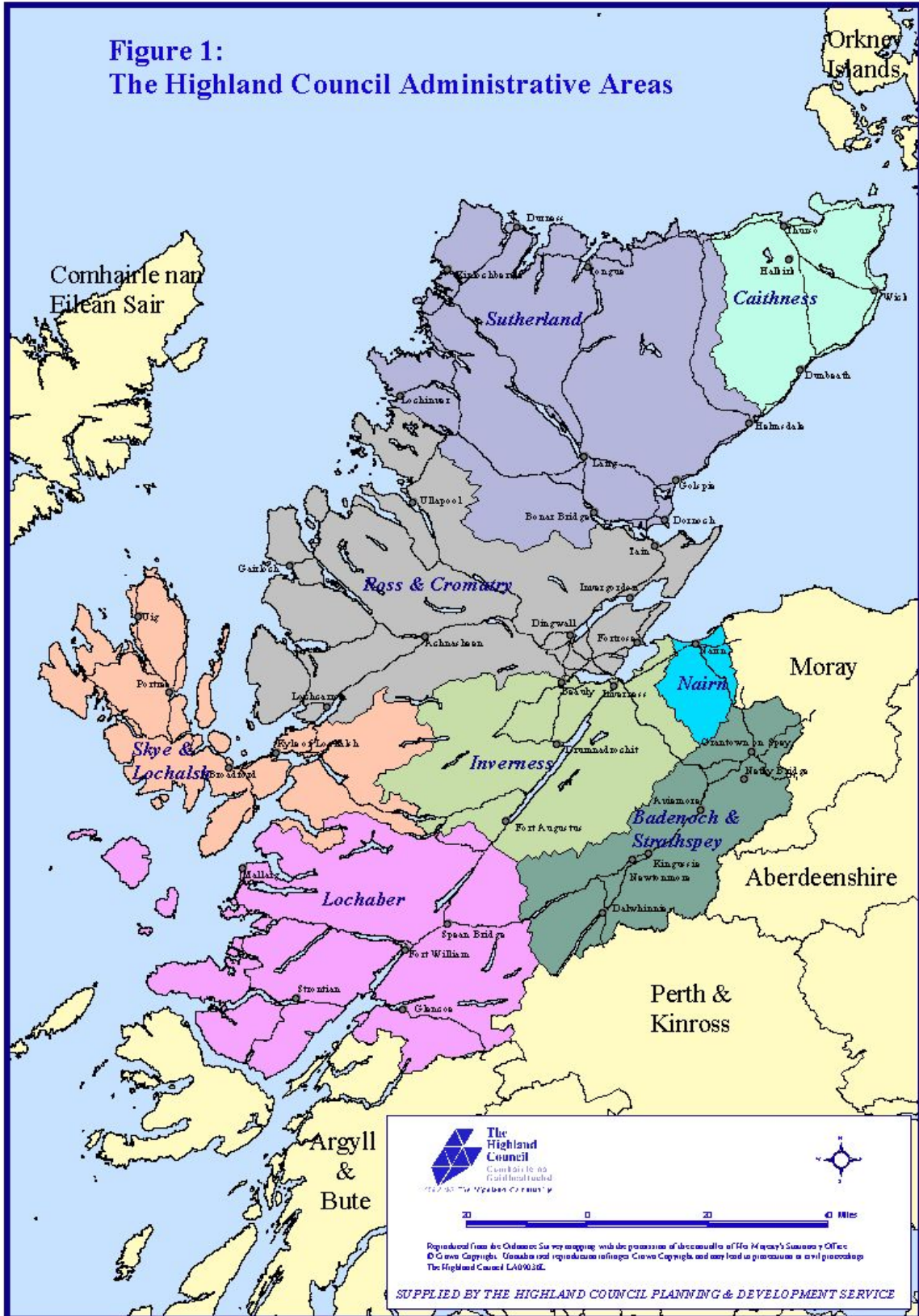
1.7.1 A local authority is required to record in a public register information regarding formal action taken by it. Regulation 14 and Schedule 4 to the Regulations provide a description of the information, which requires to be kept in the register. These include:

- identification notices
- remediation notices
- appeals against remediation notices
- remediation declarations
- remediation statements
- designation of special sites
- notification of claimed remediation
- convictions for contaminated land offences
- guidance received from SEPA, (S78V(1) – EPA)
- other environmental controls where the serving of a remediation notice is precluded.

1.7.2 This register must be kept at the local authority's principal office, The Highland Council's Contaminated Land Register will be kept and maintained by Protective Services at Glenurquhart Road, Inverness IV3 5NX.

1.7.3 The register will be available for public inspection during normal office hours. Copies of entries on the register can be obtained from Highland Council, for which a reasonable charge will be made. Applications or queries regarding entries within the register should be made through the Principal Protective Services Officer (Contaminated Land), at the above address.

**Figure 1:  
The Highland Council Administrative Areas**



## **2. Characteristics of The Highland Council Area**

### **2.1 Location**

#### 2.1.1 The Highland Council Area

2.1.1.1 The Highland Council is the northmost unitary authority on the Scottish mainland. The Highland Council comprises the former Highland Regional Council and the eight former District Councils of Badenoch & Strathspey, Caithness, Inverness, Lochaber, Nairn, Ross & Cromarty, Skye & Lochalsh and Sutherland. It is an extensive and diverse area, which at 26,484 square kilometres covers around a third of the Scottish mainland, and includes a number of inhabited islands.

#### 2.1.2 General Geography

2.1.2.1 The Highland Area has a rugged coastal fringe, which stretches 1900 km from the Ardnamurchan peninsula, north up the deeply indented Atlantic coast, along the northern top of Sutherland and Caithness, and south to the east coast estuarine systems of the Dornoch, Cromarty and Moray Firths.

2.1.2.2 The area is dissected by the deep Great Glen lochs, which run from Fort William to Inverness. North and West of these lochs lie those mountains, glens and lochs, which form the landscape for which the Highlands are renowned. The area also contains extensive lowlands to the east and north east, around the Inner Moray Firth and the “flow” country of Caithness. South of the Great Glen lie the Monadhliath and Cairngorm mountain ranges and the strath of the River Spey. The area extends southwest to Glencoe, and the Morven and Ardnamurchan peninsulas. The major islands of the Inner Hebrides lie to the west of Lochaber and Lochalsh, and further smaller islands are scattered up the west and across the north coasts of the mainland.

#### 2.1.3 Neighbouring Local Authorities

2.1.3.1 The Highland Council shares land boundaries with Moray, Aberdeenshire, Perth & Kinross, Stirling and Argyll & Bute Councils. The land along the boundary areas is predominantly rural, mountains or moorland. Comhairle Nan Eilean Siar and the Orkney Islands are the nearest Island Council areas to Highland.

#### 2.1.4 Influence on Strategy

2.1.4.1 As a local authority, Highland Council is directly democratically accountable. The strategic development of its response to the contaminated land regime, and the implementation of its strategy, will be influenced by Highland Council’s population and communities through their elected representatives.

- 2.1.4.2 The provision of services through the area offices in the former Highland Districts by a number of Council Services, with roles in the development and implementation of the Strategy will have significant and possibly unique influence on the Strategy.
- 2.1.4.3 The Highland Council's size, the distances between its communities, its distinctive topography and the proximity to the coast of many of its settlements and communities, will have a major influence on the practicalities of potential site inspections, carrying out investigations and will also effect staff and resource deployment.
- 2.1.4.4 The concentration of population in the Inner Moray Firth, its less marginal nature and increasing urbanisation, will focus and demand significant attention in the strategy and its implementation.
- 2.1.4.5 There are unlikely to be many areas where trans-boundary issues of land contamination occur with neighbouring local authorities.

## **2.2 History**

- 2.2.0.1 By 10000 BC the last Ice Age had ended, and the glaciers had retreated from Scotland leaving a barren land that was slowly colonised by grasses, followed by herds of grazing herbivores and their predators. Slowly warming temperatures changed the flora, and trees started to appear on the Scottish Highlands, and with the trees came a variety of other plant species, including edible berries. Around 7000 BC Mesolithic or "middle stone age" hunter gatherers started to inhabit the highlands and coastal areas, hunting the various deer and probably seals and fish, as well as gathering edible plants (Alston 1999). This signalled the beginning of 9000 years of occupation in the Highlands.
- 2.2.1 Early settlers
- 2.2.1.1 The Mesolithic people have left little behind them as they were very mobile moving with the resources and did not settle in any one place for long. The oldest Mesolithic site is found on the island of Rum and dates to just before 7000 BC. There are several Mesolithic lithic (worked stone) scatter sites and refuse middens in the Highlands, including Redpoint and Shieldaig in Ross and Cromarty, as well as additional sites along and near the coast (Alston 1999).
- 2.2.1.2 During the Neolithic, c.4000BC to c.2500BC, agriculture took hold in Scotland and the Highlands: gradually becoming the predominant way of life. The principal archaeological remains of the Neolithic are the large stone burial tombs used over a long period of time, some of which point to the first evidence of a local culture (Alston 1999). Also of import during the Neolithic are henges and stone circles, examples of both occur in the highlands.



- 2.2.1.3 Around 2500 BC a new group of people arrived from mainland Europe commonly known as the Beaker Culture, taller than the Neolithic inhabitants the new settlers brought with them new technologies and new customs. These included a change in burial practices and the introduction of metal working, copper, gold and bronze, though the later was slow to spread north partly due to the scarcity of tin required in the alloy.
- 2.2.1.4 At the end of the Bronze Age, c.700 BC, a new wave of immigrants arrived, bringing with them the Iron Age. The Bronze Age and Iron Age inhabitants of the Highlands were very possibly related, having a similar social structure, and possibly a similar language (Alston 1999). The immigrants brought new technologies with them that were readily incorporated and spread quickly, including iron smelting and horsemanship. Archaeologically the most prominent features are the forts, brochs, duns and crannogs.
- 2.2.1.5 During the Early Medieval times Scotland found itself playing host to other invasions, including the Scots, starting c. AD 500 and the Norse c. AD 800. The Scots, immigrants from Ireland, set up the Kingdom of Dalriada in Argyll, and under their King, Kenneth McAlpin, spread their influence across Scotland, while the Norse were busy settling along the Hebrides and Caithness. In the ninth century the Earldom of Orkney was established under Norwegian rule, and had significant influence over Caithness and Sutherland. Norse influence was strongest in the North, with limited Norse remains south of the Oykell and Dornoch Firth (Alston 1999).
- 2.2.1.6 Of the various medieval settlements, only castles and churches are readily visible, many other buildings having been built of perishable materials (Close-Brooks 1995).

## 2.2.2 Industrialisation

- 2.2.2.1 Industrialisation in the Highlands started in the 17<sup>th</sup> century. Generally development has been on a small scale due to limited resources. Industries which have done well have tended to rely on resources locally abundant, peat, barley, and fish (Close-Brooks 1995).
- 2.2.2.2 A variety of furnaces, coalmines, and other ironworks can be found in the area, ironsmelting being an early industry, using local charcoal and bog iron (Close-Brooks 1995). Also shorter-term copper and lead mining occurred in the Highlands. In addition to mines, quarries have been a major source of industrial labour and resources. Stone and slate quarries can be found dotted through out the area. Originally communities would have had their own small quarry, but with technological improvements the quarries became larger. In 1793 industrial scale quarrying commenced in Caithness (Close-Brooks 1995)

- 2.2.2.3 The failure of the Jacobite risings of the 18<sup>th</sup> century lead to subsequent Governmental efforts to integrate the Highlands into the rest of the Scotland through a combination of military, economic and legislative means (Alston 1999).
- 2.2.2.4 The 18<sup>th</sup> century saw a rise in population, despite the clearances, which resulted in large tracts of land being cleared of people in an attempt to improve the economic viability of the land. Many remaining Highland populations were relocated to the coastal areas where their reliance on fishing became important. Textiles were introduced on an industrial scale and distilling was also increased. (Alston 1999).
- 2.2.2.5 During the 19<sup>th</sup> century the population declined as a result of a combination of continued clearances, encouraged emigration, and the potato blights, starting in 1846 (Alston 1999).
- 2.2.2.6 The Highlands have had a continuing association with the military, particularly in training, strategic deployment, and in providing personnel and recruits for all the services in campaigns and wars fought throughout the 19<sup>th</sup> and 20<sup>th</sup> centuries. Population migration out of the Highlands has also continued to be a feature of the area, as has the economic reliance of Highland communities on the primary sector: agriculture, forestry, fishing, mining and quarries.

### 2.2.3 Economic Restructuring

- 2.2.3.1 Following the Second World War, attempts were again made to restructure the industrial base in the Highlands. Prompted by the raised economic aspirations and expectations of society there was a movement into employment within the engineering and construction sectors; hydroelectrics, aluminium smelters and boat yards. During the post war period there was also a large increase in employment in the primary sector, particularly in fishing. More recently with the development of off shore oil resources, fitting and fabrication along with other offshore and oil related industries have provided employment opportunities.

### 2.2.4 Influence on Strategy

- 2.2.4.1 Archaeological remains occur throughout the highlands, and are important as both potential sources, and as receptors.
- 2.2.4.2 Pre-industrial archaeological remains are unlikely to act as sources however, due to their nature they are potential receptors within the contaminated land regime.
- 2.2.4.3 Historic and more recent Highland industry includes both large and small-scale operations. These can potentially act as sources of pollutants and contamination.

2.2.4.4 The numbers and proximity to settlements of small and larger scale quarries requires special consideration within the strategy. Quarries in themselves are unlikely to present much of a hazard; it's the provenance of materials used to fill or landscape them, which may be of concern.

2.2.4.5 Military activity throughout the Highlands and around its coasts and islands has the potential to provide both sources of contaminants and receptors. Areas occupied or used by military forces may also contain valuable environmental receptors, and may be within close proximity of vulnerable controlled waters.

## **2.3 Geology**

The following sections give a general overview of the regional geology and its implications for contaminated land. However, the geology of the Highlands is very complicated and for a thorough review the reader is directed to the British Geological Survey (BGS) Regional Geology Guides. A summary of Quaternary (superficial or drift) geology and hydrogeology has been provided for the Highland area by BGS and is reproduced in Appendix III for information.

### **2.3.1 Solid geology**

2.3.1.1 This section refers to the complex strata of rock found underneath the soils.

2.3.1.2 The Northern Highlands are divided into a series of landscapes running in a roughly north-easterly direction. These are marked by the Great Glen Fault running between Inverness and Fort William, and the Moine thrust running between Loch Eriboll and the southern tip of the Isle of Skye.

Table1. Solid Geology of The Highland Council Area

Main Elements	Description	Age
<b>Foreland</b>		
<i>Lewisian</i>	Basement rock, product of repeated deformation and metamorphism	Precambrian crust of uncertain origin
<i>Torridonian</i>	Mainly sandstones and conglomerates with subordinate shales and others	Late Precambrian (1000-750 Ma)
<i>Cambro-Ordovician</i>	Quartzites, sandstones siltstones, limestones and others	Cambro-Ordovician (430-600 Ma)
<b>Moine Thrust Zone</b>	Sandstones, schists, mica, and metamorphosed shales and siltstones	Silurian/Devonian (c.400 Ma)
<b>Caledonides</b>		
<i>Moine Schists</i>	Metamorphosed sandstones, shales, mudstones, granite (post-metamorphic)	Post-Cambrian/ pre-Silurian (c.500 Ma)
<i>Dalradian Schists</i>	Metamorphosed sandstones, shales, limestones, granite (post-metamorphic)	Cambrian (c.600 Ma)
<b>Old Red Sandstone</b>	Sandstones, mudstones, shales and conglomerates	Devonian (350-400 Ma)
<b>Lavas</b>	Volcanic sequences (primarily basaltic) underlain by Triassic and Jurassic rocks	Tertiary (c.60 Ma)

2.3.1.3 The sub strata in the Highlands fall into five general groups of main elements (Table 1). Oldest is the foreland, found in the north-west of the Highlands and ranging across the western coast, these are the ancient rocks of the Lewisian Gneiss, overlain by Torridonian Sandstone, which in turn is overlain by Cambro-Ordovician rocks (Roberts, 1998).

2.3.1.4 The Moine Thrust marks the western extent of the Caledonides, separating these rocks from the rest of the highlands. The Caledonides are marked by significant outcroppings of igneous rocks on both sides of the Great Glen Fault (Fletcher et. al., 1996). In addition, along the eastern coast and north to Caithness is the Old Red Sandstone, a sedimentary fringe of Devonian rocks. Also found are Tertiary lavas, these form volcanic sequences on the Isles of Skye and Rum, and the Ardnamurchan peninsula (Figure x).

2.3.1.5 Geology offers potential pathways for contaminants, both natural and artificial, by facilitating the transmission of these contaminants. Porous substrata, such as the sandstones found along the eastern coastline of the Highlands, allow certain materials to permeate, possibly entering ground waters and being passed to additional receptors. Certain strata contain sources of ground water and are thus important receptors that must be protected.

2.3.1.6 The main types of solid geology to be considered within the strategy are those capable of holding or transmitting waters. As such these are likely to contain groundwater receptors and act as pathways within a pollutant linkage. These consist mainly of the Old Red Sandstone sedimentary formations found predominantly on the east coast, around the Inner Moray Firth, and across Caithness.

2.3.1.7 Other types of solid geology may also contain groundwater which whilst low in yield may be locally important.

## 2.3.2 Superficial Deposits, Drift

2.3.2.1 The Highland area has been extensively shaped and formed by glacial events, leaving large amounts of glacial deposition in some areas, while having left other areas devoid of much drift through the scouring affect. The western seaboard of the highlands is predominantly free of drift (Johnstone & Mykura, 1989). Conversely, large areas of boulder clay, a mixture of boulders of varying sizes and gritty clay, have been deposited east of the Moine Thrust. These deposits are largely impermeable to water, and have contributed, along with scouring, to the development of the lochs, as well as the extensive tracts of peat, as found especially in Sutherland (Johnstone & Mykura, 1989).

2.3.2.2 Closer to the edge of the glacial reach, large quantities of fluvio-glacial sands and gravel have been deposited in the major Highland glens (Roberts, 1998) such as the Strathspey and Strathnairn. They also occur along the southern margin of the Moray Firth and on the coastal lowlands around the Beaully, Cromarty and Dornoch Firths. Glaciofluvial deposits are generally thickest in the south-eastern part of the region they commonly rest on till (boulder clay) or bedrock and are generally more permeable than either.

2.3.2.3 River depositions of gravel, sand, silt and clay across the floors of straths and glens, and at river deltas have provided alluvial deposits which when consisting mainly of sands and gravels provide highly permeable deposits.

2.3.2.4 These glacial and alluvial deposits form a relatively thin mantle of Quaternary sediments, which can be highly permeable and hold significant reservoirs of groundwater. Their closeness to the ground surface makes the water held within them particularly susceptible to contamination from industrial activities, disposal of wastes and agricultural applications. Exploitation of sands and gravel's contained in glaciofluvial deposits evidenced by the number of historic and contemporary sand and gravel workings; both introduce a more direct path to groundwaters and where filled or landscaped with materials provide a potential source of contamination (Appendix III)

2.3.2.5 Modern soils in the highlands are very diverse, but tend to be shallow, and often are wet and acidic with a high concentration of organic matter. In addition they frequently have a coarse texture and a high stone content (Taylor & Nortcliff, 1996).

2.3.2.6 An indurated horizon is often found in Highland soils, this is a layer of soil, thought to have been formed through repeated freezing and thawing cycles. Typically located 40cm below surface, this layer is relatively impermeable. An indurate horizon can block drainage (Taylor & Nortcliff, 1996).

2.3.2.7 Most of the parent material of Highland soils are acidic, resulting in acidic soils which are more likely than non-acidic soils to release heavy metals, allowing them to migrate to other sites. Gleys (waterlogged and anaerobic soils) are also found in Caithness (Taylor & Nortcliff, 1996).

### 2.3.3 Influence on Strategy

2.3.3.1 Geology is very important in both the assessment and the projection of land contamination. Geology can play a role in all aspects of land contamination and to a large extent will dictate whether pollutants remain in situ or are able to migrate through the strata, potentially reaching water sources or other receptors.

2.3.3.2 Both solid and drift geology will by virtue of their varying abilities to transmit contaminants, have the ability to act as pathways, and will receive important consideration within assessment of pollutant linkage.

2.3.3.3 Geological strata and deposits can contain valuable ground water resources. Identification of important and vulnerable ground waters will be an important consideration within the development and implementation of the strategy.

2.3.3.4 Certain naturally occurring elements and chemicals can pose risks to local receptors given a suitable pathway. These include arsenic, uranium (found in Caithness), radium, lead, and some greenhouse gases, including methane, which can be produced naturally in areas such as peat bogs, common in the highlands. Information on soils and naturally occurring elements and compounds available through BGS and the MacAulay Land Use Research Institute (MLURI) will be used in the development of the contaminated land database.

## 2.4 Community

### 2.4.1 Population

2.4.1.1 Population density varies markedly across the Highlands. The Highland Council has the lowest population density in Scotland at 8 persons per square kilometre. The busy town and city centres provide stark contrast with the areas' villages, scattered rural communities and inhabited islands, and there is a clear distinction between the relatively heavily populated area around the Inner Moray Firth and remainder of the Highland Council area.

2.4.1.2. The population of The Highland Council area is one of the fastest growing in Scotland, and around the City of Inverness, the Highland "Capital", is one of the fastest growing population centres in Europe. The population within The Highland Council's area is projected to increase by 5% from its 1996 level of 208,700 to around 220,000 by 2017. Much of this growth is expected around the Inverness area and will increase demand for the supply of land for housing, industry and business. Currently around 30% of the population of Highland council live in the coastal area around the City of Inverness

### 2.4.2 Settlements

2.4.2.1 Inverness is Highland Council's largest settlement and is at the centre of the Inner Moray firth which also contains settlements of Culloden, Alness, Dingwall, Invergordon, Tain and Nairn which at the time of the 1991 census had populations of greater than 4,000. Outwith this area, the settlements of Thurso, Wick, Fort William also fall within this population size.

2.4.2.2 Settlements of greater than 1000 at the time of the 1991 census are listed in Table 2. There are a further 145 recognised settlement zones, (villages), across the Highlands with populations (at the time of the 1991 census) of less than 1000.

2.4.2.3 The impact of remoteness on communities outwith the major population centres, in terms of service provision is recognised in Highland Council's structure plan. The structure plan supports the consolidation of existing settlement hierarchy, seeking to enhance the role of Inverness as a regional centre yet provide support for the sub regional and local centres by spreading development beyond Inverness.

**Table 2. Settlements of greater than 1000 population (1991 census) within Highland, by Highland Council Area.**

<b>Settlement Zone</b>	<b>Population</b>		<b>Settlement Zone</b>	<b>Population</b>	
<b>BADENOCH &amp; STRATHSPEY</b>			<b>ROSS &amp; CROMARTY</b>		
Aviemore	2405	σ	Alness	5874	σ
Grantown	3330	σ	Avoch	1015	
Kingussie	1557	σ	Conon Bridge	1798	
			Dingwall	5459	λ
<b>CAITHNESS</b>			Evanton	1552	
Castletown	1297		Fortrose	1908	
Halkirk	1585		Gairloch	1061	σ
Lybster	1246		Invergordon	4145	σ
Thurso	9233	λ	Kildary	1451	
Wick	8754	λ	Maryburgh	1269	
			Muir of Ord	2735	σ
<b>INVERNESS</b>			North Kessock	1377	
Ardersier	1573		Seaboard	1533	
Beaully	1502	σ	Strathpeffer	1385	
Culloden	8728		Tain	4119	σ
Drumnadrochit	1043	σ	Ullapool	1558	σ
Inverness	41766	v			
Kiltarlity	1002		<b>SKYE &amp; LOCHALSH</b>		
			Broadford	1126	σ
<b>LOCHABER</b>			Portree	2458	λ
Fort William	10939	λ			
Kinlochleven	1081	σ	<b>SUTHERLAND</b>		
			Brora	1922	σ
<b>NAIRN</b>			Dornoch	2128	σ
Nairn	8488		Golspie	1657	σ
Regional Centre	v	Sub Regional Centre	λ	Local Centre	σ

### 2.4.3 Housing

2.4.3.1 As a consequence of changing population, size and dynamics, housing demand within Highland Council area is predicted to increase. Highland Council's Structure Plan recognises that adequate provision of quality housing is fundamental to creating and maintaining balanced communities, contributing to social and individual wellbeing, and as a pre-requisite of economic growth. Importantly this plan highlights that the provision of adequate housing must be met in a way, which minimises the impact on the environment.



2.4.3.2 Highland Council predicts an overall requirement for sites for maximum additional 26,200 new houses in the period up to 2017. Such demand necessitates an adequate provision of land. The Council anticipates that much of the requirement for additional sites will be met through redevelopment and rehabilitation and land allocations within existing settlements.

2.4.3.3 The structure plan indicates the main demand for the allocation of housing sites is directed towards Inverness. To deflect some of the development pressure away from Inverness and to assist in supporting the sub regional functions of Nairn and the Evanton, Alness and Invergordon corridor, allowance for housing land allocations have been increased above anticipated needs in both Nairn and Ross & Cromarty.

2.4.3.4 In a desire to promote development to assist in stemming population loss and the regeneration of the sub region, additional allocation is anticipated in Caithness. The Structure Plan also indicates that further new settlements may be particularly appropriate to assist in repopulating fragile rural areas or to accommodate demand in the Inner Moray Firth area.

2.4.3.5 Important infrastructure provisions will be required to meet the needs of additional housing land allocations.

#### 2.4.4 Recreation

2.4.4.1 Highland Council has adopted a proactive approach and the wise use of the natural environment improving accessibility to goods and services and addressing the need for quality living environments (The Highland Council Structure Plan). These are all of relevance to both formal and informal sports and recreation facility provision. Highland Council recognises issues of land use related to the provision and the importance of safeguarding sports fields and parks from development. Amenity open space also provides for informal recreation and is often under pressure within settlements.

2.4.4.2 The Highland Council confirms its support for recreational land protection and provision in its Structure Plan Policy SR2

*"The Council will seek to protect sports facilities and amenity open space within settlements from development, unless provision for replacement facilities of an equivalent standard is made within the locality. Local plans will assess existing open space provision, identify deficiencies and establish standards for the provision of new or the improvement of existing open space".*

#### 2.4.5 Influence on the Strategy

2.4.5.1 The human population of the Highlands is a major potential receptor within the contaminated land regime. Whilst there is a variety of instances and situations where pollutant linkage may arise with regard to elements of the population,

groups or individuals the initial broad screening for this receptor will prioritise population according to density.

2.4.5.2 Growth in population, demand for housing and protection of recreational open spaces will increase pressure for redevelopment of sites potentially effected by contamination, particularly in the Inner Moray Firth area. This is likely to push the consideration of land contamination issues within such areas either in the implementation of the inspection strategy or through the development control process. The influence this will have on the strategy is potentially significant, but difficult to assess at this stage.

## **2.5 Economy**

### **2.5.1 Business and Industry**

2.5.1.1 The creation of an improved business environment is an important strategic theme within Highland Council's Structure Plan. It recognises that the provision for business and industry is closely related to community, environmental and infrastructure considerations. The availability of land and premises is an important factor in accommodating development and supporting new business growth, the provision of land for business and industry should ensure a distribution of resources focussed on settlements and consistent with the proposed settlement strategy (The Highland Council Structure Plan 2.6.3).

2.5.1.2 Highland Council recognises the need for provision of a range of suitable sites in terms of size, quality and location to cater for the development of small to medium sized businesses and the needs of larger indigenous and inward investment companies. The Council and the Local Enterprises Companies are the primary providers of both sites and premises, in partnership with the private sector. Sites suitable for such developments are highlighted in the development of Highland Council Local Plans.

2.5.1.3 Further promotion of business and industry has been taken forward through the planning process through the designation of Simplified Planning Zones. One such zone exists at present around Alness/ Invergordon (The Highland Council Structure Plan 2.6.4).

2.5.1.4 Highland Council's Structure Plan identifies areas for the promotion of business and industrial development in policies B<sub>1</sub> to B<sub>3</sub>, reproduced in Appendix IV for information.

## 2.5.2 Agriculture and Crofting

2.5.2.1 Agriculture and Crofting form the backbone of the Highland identity, both in terms of socio-economic fabric and natural heritage character. The farming sector is particularly vulnerable to external factors and farmers currently face unprecedented difficulties in maintaining their livelihood. A major characteristic of agriculture in Highland is its stewardship of the high environmental quality of the area. Highland Council's Structure Plans seeks to set out policies, which promote and maintain its agricultural and crofting sectors.

2.5.2.2 Considerable urban growth is anticipated within the Inner Moray Firth area and is likely to put tremendous development pressure on prime quality Highland agricultural land.

2.5.2.3 In its structure Plan, The Highland Council also seeks to safeguard agricultural land which although of lesser quality may nevertheless be important locally for the viability of a farm unit, croft or the local agricultural economy;

*Policy A1 "Development on prime quality or locally important agricultural land will not be permitted except where the development is essential to the interests of the local community and no reasonable alternative location is feasible".*

## 2.5.3 Forestry

2.5.3.1 Forestry is a significant land use, covering about 12% of the Highlands and has a wide range of environmental, economic and social impacts across the whole area. Importantly it provides employment in the saw milling and timber processing industry, concentrated around the Moray Firth, Strathspey and Fort William.

2.5.3.2 The Council is keen to encourage the development of a diverse, multi-purpose forest resource which creates lasting local employment opportunities, makes best possible use of native species, compliments the landscape, enhances public access, helps to sustain wildlife and helps safeguard the quality of river and loch systems.

2.5.3.3 The Council has prepared an indicative Forestry Strategy which has divided the Highland area into Preferred, Potential and Sensitive Zones for planting, relative to competing land pressures, and constraining interests.

## 2.5.4 Fisheries and Aquaculture

2.5.4.1 Highland has one of the most indented coastlines in Europe. It has largely unpolluted coastal and inland waters, an extensive inshore zone, and a network of freshwater rivers and lochs. These provide a wide spectrum of fishing and aquaculture opportunities whose activities and impacts straddle the divide between water and land.

2.5.4.2 Commercial fishing in the waters around Highland has traditionally been one of the

the most important elements of its rural economy, and aquaculture has helped sustain populations and services in many of its remotest communities. Game fishing contributes to the wider Highland economy as a significant aspect of the tourism industry. There are environmental considerations both in terms of the impact of development on these industries and in terms of the potential negative impact of fishing and aquaculture developments themselves.

## 2.5.5 Tourism

2.5.5.1 Tourism is vital to the Highland economy contributing approximately 20% of Highlands Gross Domestic Product, and relies heavily on visitor's perception of quality of both the natural and built environment. Tourism makes major demands on infrastructure and facilities and Highland Council recognises that there is considerable scope for improvement in both quality and level of provision of many of these. The Council also recognises that quality interpretation is at the heart of enhancing the visitor experience of the Highlands and is a key component of the development of tourism infrastructure.

## 2.5.6 Integrated Rural Development

2.5.6.1 The way in which land and coastal waters are managed is crucial to the well being of many Highland communities. The Highland Council recognises the importance of an integrated approach to rural development, which optimises economic, social and environmental interests encapsulating, as it does, sustainable development.

2.5.6.2 The Council views this as the way forward and supports this approach through a series of policies (Structure Plan) on;

- area sustainable development strategies,
- land management,
- management of the natural and cultural heritage,
- national parks, and
- community land ownership and management.

2.5.6.3 In doing this the Council recognises the importance of land in defining natural and cultural heritage, providing a resource for sustaining communities and meeting local development needs for business, housing and other community facilities, and the key role the local authority can play in steering and integrating development.

## 2.5.7 Influence on Strategy

2.5.7.1 The influence of historic land use, by a number of business and commercial sectors within Highland, on strategy development and implementation is considered elsewhere in this document (sections 2.6.5 and 3.5.1).

- 2.5.7.2 Forestry, agriculture, aquaculture, fishing and shooting involve crops and animals specified in the statutory guidance as receptors covered within the description of property. These receptors will be considered within the development and implementation of the strategy. There may also be potentially contaminative activities associated with aspects of these land uses.
- 2.5.7.3 The competing demands for land for the economic needs of Highland communities increase pressures to redevelop brownfield, vacant and derelict land. This and a number of fiscal and other incentives are likely to increase the number of such sites subject to Development Control, consequently decreasing the number of sites likely to be considered within the contaminated land regime.
- 2.5.7.4 Maintenance of high environmental quality, important in most economic sectors within Highland, is likely to have a dual effect in the consideration of sites within the contaminated land regime. Promotion of redevelopment of potentially contaminated land and restriction of greenfield development will encourage the consideration of potential sites within the Development Control process.
- 2.5.7.5 Potential sites which lie outwith areas designated within the settlement strategy or local plans or simplified planning zones, but with comparable awarded priority, or contamination profiles, will be given higher priority for consideration within the contaminated land regime because their potential problems are less likely to be dealt with through redevelopment.
- 2.5.7.6 The Highland Council recognises the importance of balancing the demands on land in its efforts to sustain communities, and in its role in directing and integrating development. This role will have a major effect in addressing development pressures, which are likely to drive redevelopment of sites through the Development Control process and therefore remove them from consideration within the contaminated land regime.

## 2.6 Land

### 2.6.1 Land Cover

A profile of the land cover within The Highland Council area is presented in Table 3. This information is extrapolated from MLURI 1988 data.

**Table 3. Land use characteristics of The Highland Council area**

<b>Land use category</b>	<b>% of land cover</b>	<b>Area (Hectares)</b>
Arable	2.1	588573.0423
Broad-leaved/Mixed Woodland	2.1	582747.8665
Coniferous Woodland	5.8	1627416.9510
Development	0.4	111538.0204
Fresh Water	2.7	766286.4438
Heather Moorland	45.2	12667275.9270
Improved Grassland	5.4	1499347.9320
Miscellaneous	6.7	1884437.2860
Peatland	15.0	4218741.3240
Recent Plantings/Fellings	4.0	1129329.0080
Rough Grassland	10.5	2945943.4310

### 2.6.2 Land Ownership

2.6.2.1 The Highland Council maintains a land ownership database for areas of land greater than 100 hectares. Some information on smaller areas of land is also held within this database. Land ownership information may also be available through Highland Councils Assessors and Area Valuation Rolls. Ownership information may also be held within other council services. The expertise of other council services may be used in pursuing information on land ownership where potential significant contamination issues arise in relation to property or sites highlighted during implementation of the strategy.

2.6.2.2 Information on potential land contamination may be available from property owners or estates where there may have been historical contaminative land use. A mandatory accountancy standard applicable to most organisations producing financial statements, known as “FRS12 -Provisions, Contingent Liabilities and Contingent Assets” requires the assessment of provisions and contingent liabilities. Organisations with potentially contaminated land, or those whose activities may have lead to historic contamination would need to consider such potentially contaminated land as Provisions or Contingent Liabilities. Such assessments and the strategies these organisations prepare to deal with sites, may be very useful to local authorities when implementing their inspection strategies

### 2.6.3 Local Authority Estate

2.6.3.1 The Highland Council is a major landowner within the Highlands, much of its estate is currently used in direct service provision, depots, stores, buildings etc. Highland Council's Estate also includes land and buildings used for industrial purposes and for the transfer and disposal of wastes.

2.6.3.2 Issues of ground contamination are most likely to arise on land with historical potentially contaminative industrial use, and land used historically for the transfer and disposal of wastes. There is also a potential for the existence of contaminated materials in parcels of reclaimed land managed by the Council. Information on the extent of Highland Council's estate is held by Property and Architectural Services in the corporate property database.

2.6.3.3 The corporate property database is linked to a GIS (Geographical Information System), which includes point references for each parcel of land or property. A project is ongoing to identify potentially contaminated land within Highland Council's estate and prioritise sites for more detailed inspection and investigation. As a limited data set from the Highland Council's estate is readily accessible through the GIS, this project may provide priority sites whilst the process of strategy adoption and implementation is progressing. Where priority sites are identified, the lack of an adopted strategy will not prohibit further investigation and action. Sites will receive such prioritisation in line with the corporate priorities described in this strategy (section 3.4.5)

2.6.3.4 There will be full liaison with any Council Service identified with potential contaminated land liabilities. Any decisions on investigation and remediation of Council owned or managed sites will be taken with due regard to the principles embodied in site-specific risk assessment, sustainable development, and transparency in local government.

### 2.6.4 Waste Disposal

2.6.4.1 With the public health revolution of the late 19<sup>th</sup> and early 20<sup>th</sup> centuries the disposal of waste became an issue considered at the local authority level. By the beginning of the 20<sup>th</sup> century local waste disposal sites or "tips" were common on the outskirts of villages towns and cities. Communities in the Highlands, in common with those elsewhere, have historically disposed of waste in local tips; this practice has persisted longer perhaps in the Highlands, as many communities are remote.

2.6.4.2 The nature of household wastes up until relatively recently was such that in general, material going to the tip would have been relatively inert and not considered as a problem. Management of "tips" would have consisted of judicious burning, selective scavenging and burial of remaining materials and residues.

2.6.4.3 The significant change in composition of the waste stream in the last 50 years, the greater potential for disposal to impact within the local environment, and increasing awareness of waste and environmental issues, has sponsored a series of waste management legislation and the tighter regulation of disposal. This and the major structural changes in the provision and delivery of local services have driven both the centralisation of waste management and disposal, and the increase in size and capacity of disposal sites. As a result many of the local tip sites have been closed.

2.6.4.4 The cost and practicalities of waste removal in dispersed and remoter communities has lead to specific disposal circumstances arising. For example: the unauthorised disposal of obsolete cars in disused quarries.

2.6.4.5 It should also be borne in mind that unregulated disposal of commercial and industrial waste may be associated with tip sites. Commercial and industrial waste composition can have an important effect on the likely pollution from, or contamination in such sites. It is possible that historic commercial and industrial waste materials have been used in land reclamation and landscaping, or may have been tipped into convenient quarries or other excavations.

2.6.4.6 Existing licensed landfill sites, subject to current regulatory regimes are outwith the scope of the contaminated land regime. Historic tip sites and landfill will be considered as potential sources of contamination. Information held within the Council, and by Council staff regarding historical disposal will be collated and other sources of such information explored.

## 2.6.5 Potentially Contaminative Land Use

2.6.5.1 The most probable sources of soil contamination to be considered within this regime are likely to have arisen around the supply, storage and use of, and wastes arising from materials used in historic commercial and industrial processes. There may also be issues of land contamination associated with the historic disposal of domestic wastes and on land used in military activities.

2.6.5.2 Industry in the Highlands has developed around the exploitation of abundant natural resources, and the growth of population around centres of trade.

Such industrial land uses within Highland include:

- Quarrying and mining,
- Manufacture and processing of textiles and rope,
- Foundries, smelting, fabrication and engineering
- Land where significant quantities of chemicals or fuels have been stored, used or processed,
- Timber processing and treatment,
- Gasworks, energy production, electricity generation,



- Dock yards, airports, transportation and railways,
- Use, storage, or disposal of explosives or military ordinance,
- Waste recycling, treatment, disposal and sewage works.

## 2.6.6 Influence on the Strategy

2.6.6.1 Information on land use and ownership, the extent of local authority estate and condition, and the identification of land which, may have had contaminative uses, is vital within the development and implementation of the strategy.

2.6.6.2 Many Highland communities will have within close proximity of their settlements a disused or closed tip site, there may be numerous unofficial tips particularly in remoter areas, and commercial or industrial wastes may have been used historically in land filling or landscaping. Developmental pressures, expansion of communities and population growth may have resulted in increased potential human contact with such sites and their contents. Materials migrating from these sites may effect environmental receptors, property or controlled waters. Known, suspected and potential historic tip or landfill sites will have an important consideration within the strategy.

2.6.6.3 Liaison with representatives of industry and organisations with potential contaminated land interests will be encouraged to promote consideration of their liabilities and obligations. Similarly liaison within the Council will undertake to promote the consideration of potential liabilities and obligations within the current local authority estate, and previous local authority land use.

## 2.7 Water

### 2.7.1 Controlled Waters

2.7.1.1 Controlled Waters are defined in Part II of the Control of Pollution Act 1974 (as amended by the Water Act 1989) as any of the following classes:

- Relevant territorial waters (3 miles seaward from measurement baselines)
- Coastal waters (waters which extend landward from measurement baselines to highest tide limit or fresh water limit of any rivers)
- Inland waters (loch, pond or river)
- Ground waters (contained in underground strata, borehole or excavation)

### 2.7.2 Surface Waters

2.7.2.1 Surface waters in The Highland Council area provide a valuable resource, not only in terms of supporting environmental and biological quality, but also in provision of water supply, their recreational, commercial and industrial uses, and their impressive scenic and landscape value. Maintaining and protecting marine and

freshwater surface water resources are important priorities within the council's strategic response to the contaminated land regime.

2.7.2.2 Some surface water quality is surveyed on a routine basis. In Scotland SEPA undertakes this responsibility and assesses quality on the basis of chemistry, biology, nutrients, dangerous substances and aesthetic conditions. SEPA will be consulted on the quality of such waters as they are incorporated as potential receptors within the contaminated land database.

### 2.7.3 Groundwater

2.7.3.1 Ground water is a valuable resource throughout Scotland and within Highland and comprises of body's of water contained as aquifers within both solid and drift geology. Ground waters can be important in water supply, and in the supply of base flow to rivers and other surface waters.

2.7.3.2 The value and vulnerability of ground water is dependant on the strata (solid geology) the ground water is contained within, the depth of the unsaturated zone which lies above the water table, the presence and nature of the quaternary or drift geology overlying the solid geology and the soil leaching potential. A summary of Highland quaternary and hydrogeology has been prepared by the British Geological Survey (BGS) and is presented for reference in Appendix III. The eastern coastal area of The Highland Council lies within the Caithness and Moray Firth Old Red Sandstone province, areas of which have been highlighted as prime aquifers. Information on regional ground water is currently sparse, although available data suggests recoverable ground water to be negligible within this province (Fletcher et. al., 1996).

2.7.3.3 A ground water policy was initially developed by the National Rivers Authority (NRA), a statutory body established for England and Wales under the Water Act 1989, to take over the responsibilities of their water authorities. The Water Resources Act 1991 re-enacted the Water Act, covering the duties of the NRA, which from 1 April 1996 became the responsibility of the Environment Agency. The Water Resources Act provides a duty to protect the quality of ground water and conserve its use for water resources. In 1992 the NRA outlined a policy for protecting ground water supplies and defined source protection zones. Whilst this policy is not statutory, the compilation of maps showing groundwater areas and their vulnerability has been undertaken by the Environment Agency (SEPA's equivalent in England and Wales), and are available to English and Welsh local authorities.

2.7.3.4 Scotland's strategy for the protection of ground water was originally published in 1995, and by SEPA in 1997 (SEPA Policy No 19) and uses the same approach as the NRA in identifying protection zones. Although SEPA indicated their plan to prepare similar maps for Scotland in their policy, these are as yet unavailable to local authorities. Provision of such spacial information would be most valuable in

implementing the strategy and identifying potential contaminated sites. The Highland Council will encourage SEPA to produce such maps.

2.7.3.5 Large scale hydrogeological and ground water vulnerability maps covering the whole of Scotland are produced by the BGS

#### 2.7.4 Water Supplies

2.7.4.1 North of Scotland Water Authority (NOSWA) undertakes the provision and maintenance of public water supply throughout the Highland area. There are 153 public water supplies serving Highland communities, ranging in size from sources serving as few as 10 people, to regional water schemes serving as many as 50,000 people.

2.7.4.2 The Highland Council Protective Services regulate and monitor approximately 2,800 private water supplies across The Highland Council area. These supplies serve a population estimated at 16,927 and range in size from those serving individual domestic properties, to those supplying major food and drinks manufacturers. (reference; Private Water Supplies (Scotland) Regulations 1992, 2000 Return. The Highland Council, Protective Services)

2.7.4.3 Water supplies arise either in groundwater or surface waters, and as such are receptors in terms of the contaminated land regime. In addition their distribution and use allows them to be considered as possible pathways to human population receptors.

#### 2.7.5 Influence on Strategy

2.7.5.1 Consideration of Highland water resources will be significant within the development and implementation of the strategy. Interaction with a number of agencies whose responsibilities include water resource issues is essential within the strategy.

2.7.5.2 The Highland Council considers that the contaminated land regime should not be utilised as an alternative to existing statutory regimes with water quality remits, and will encourage issues of poor water quality to be considered within existing regimes where this is deemed appropriate.

2.7.5.3 As information on controlled waters, vulnerable ground and surface waters, and private and public water supplies is generated or becomes available from a number of sources, it will be incorporated into the contaminated land database.

## 2.8 Ecology

2.8.0.1 The ecology of the Highlands is diverse, reflecting the wide range of habitats present in the region. Key factors influencing this include the degree of altitudinal range (from extensive coastline to Britain's highest mountain), and considerable climate variation (from the oceanic influenced west coast to the relatively dry areas east of the Cairngorms, and the near arctic conditions of their high plateau).

2.8.0.2 Of particular note is the large number of species at the edge of their range, some of which are genetically distinct (for example: Scots pine and many arctic-alpine plants). Other species do not occur in significant numbers elsewhere within the European Union other than in the north of Scotland (examples include: black-throated diver, dotterel and string sedge). There are also populations, which are of genuine global importance, which are uniquely indigenous, or which are internationally threatened, for example: grey seal, arctic and great skua, Scottish primrose and Scottish crossbill.

### 2.8.1 International Sites

2.8.1.1 Highland's rich biodiversity is reflected in the range of proposed, candidate and classified international sites. This includes a number of Ramsar sites (an international designation for birds) and a wide raft of sites enjoying protection under European law (82 proposed or candidate Special Areas of Conservation (SAC) and 37 Special Protection Areas for wild birds). These European sites cover in total 15 % of the land area of Highland and include peatlands, wetlands, woodlands, mountainous areas, and rivers including the Spey, certain sealochs and parts of the wider Moray Firth.

### 2.8.2 National Sites

2.8.2.1 There are 360 Sites of Special Scientific Interest in Highland, covering 19% of the land area, and which encompass the international sites previously mentioned as well as other areas. This is a reflection of the ecological importance of the region and general sympathetic management of the area. SSSI legislation places responsibilities on those with an interest in the land to consult Scottish Natural Heritage when under taking management activities: this includes remediation. There are also 139,5000 ha of National Nature Reserve, all of which will enjoy the SSSI protection. The Cairngorms is due to receive National Park Status in 2003.

### 2.8.3 Sites Outwith Protection Under Part IIA

2.8.3.1 There is a range of sites which fall out with the contaminated land regime but which none the less have some form of recognition. These include voluntary reserves, community woodlands and informal areas for wildlife. There are no regional or country parks. However, such is the nature of Highland's wildlife that

many of its species rely upon, and many of its habitats occur, in areas of no designation what so ever.

#### 2.8.4 Influence on Strategy

2.8.4.1 National and international sites are identified locations of specified receptors within ecological systems.

2.8.4.2 There is a statutory requirement to consult SNH regarding designated sites, falling within the contaminated land regime, which are subject to remedial action. In general over-riding interests of public health would take precedence over nature protection, but only if actions were shown to be unavoidable, therefore early consultation with SNH as the relevant agency is essential.

2.8.4.3 It is also probable that some of the species present may be key receptors, particularly marine species and birds in any contaminated estuarine areas. Runoff into freshwaters might also be a problem.

2.8.4.4 Although certain quarry sites may be important in terms of their vegetation or even fossil outcrops, no particular conflicts have been identified as yet in relation to toxic spoils, which may themselves provide features of scientific interest due to flora, and fauna they may support.

2.8.4.5 There may be some potential nature conservation sites, currently unidentified, which will be affected either by land contaminants or remediation.

### **3. Strategy**

#### **3.1 Outline**

- 3.1.1 The following sections of the report describe how The Highland Council will address the development and implementation of its strategic response to the contaminated land regime.
- 3.1.2 It identifies the aims and objectives of the strategy and outlines the roles of various Services within The Highland Council. The strategy will address the issues of land contamination by developing an information management system utilising a GIS database.
- 3.1.3 Elements of the pollutant linkage (source-pathway-receptor), likely to be important within The Highland Council area are described.
- 3.1.4 The GIS database will be populated with information from a number of sources. The sources of information currently being considered are described. It is envisaged that the database will be added to, as new sources of information are identified and existing information is updated or reformatted, in what is likely to be an ongoing process. Once this database has been populated to an extent, which will allow a meaningful interrogation, initial screening of the information will be carried out.
- 3.1.5 The Highland Council priorities within the strategy are identified and procedures for identifying and prioritising sites are described. This process will take the form of a number of stages where the impact on identified receptors is considered from a number of potential sources, and assessed against the existence of known or possible pathways. Such screening will identify sites, which by virtue of the imminent danger or the potential hazard they present, require further priority site investigation.
- 3.1.6 Sites, which are highlighted, outwith this process will not be precluded for priority treatment but will be assessed against the priority criteria developed for the screening and evaluation procedures.
- 3.1.7 Further sections go on to outline the internal procedures for dealing with the contaminated land regime, and issues associated with land contamination. They highlight important communication considerations and address issues of timescales for meeting objectives and inspecting parts of The Highland Council area, and strategy review.

## **3.2 Aims and Objectives**

3.2.1 The Highland Council Contaminated Land Inspection Strategy aims:

- to demonstrate the Council's strategic approach to the contaminated land regime and integrate the actions of individual Council Services around issues of land contamination,
- to provide a framework within which the Council can implement its responsibilities in terms of the contaminated land regime,
- to outline a system for the development and management of contaminated land information,
- to ensure that the approach to inspection is carried out in an ordered and efficient manner and is subject to appropriate consultation and review,
- to highlight the influence the characteristics of the Highland area have on the implementation of the contaminated land regime, and
- to encourage voluntary remediation where contaminated land is identified or considered likely,

3.2.2 Its objectives include:

- provision of a documented strategy for the information of council members and officials, interested parties and individuals, and members of the public,
- identification of potential sources, receptors and possible pathways,
- collation of existing information within the council, and identification of important information held outwith the council,
- development and management of an electronic contaminated land data base,
- targeting of priority areas for the investigation of historically polluted land, and land likely to fall within the statutory definition of contaminated land,
- identification and where necessary determination of statutorily contaminated land, and
- provision and maintenance of a contaminated land register.

### **3.3 Roles of the Highland Council Services within the Inspection Strategy**

- 3.3.1 Protective Services are responsible for the development and implementation of the Inspection Strategy, through the Principal Protective Services Officer (Contaminated Land) (PPSO.CL). The PPSO.CL will oversee information management within the regime, carry out procedures to identify priority sites, liaise with external organisations and appropriate persons where identification of contaminated land is likely, and ensure remediation through voluntary agreement, formal designation or direct intervention.
- 3.3.2 The PPSO.CL will be responsible for reviewing the Inspection Strategy and timescales, ensuring objectives are met within appropriate timescales and advising the Highland Council on land contamination issues.
- 3.3.3 Within the Highland Council an officers working group has been established to consider corporate issues arising as a result of the development and implementation of the contaminated land regime. Importantly, the working groups remit includes, in relation to this regime, a review of the impact on, and interaction with existing service functions.
- 3.3.4 The PPSO.CL chairs this working group, which has delegates representing the services listed in Table 4



TABLE 4 The Roles of Highland Council Services Within the Regime

<u>SERVICE</u>	<u>ROLE WITHIN REGIME</u>
<b>Planning &amp; Development</b>	
<ul style="list-style-type: none"> <li>▪ Community Planning &amp; Economic Development</li> </ul>	<p>Advice on strategic planning considerations, local plans and structure plan.</p>
<ul style="list-style-type: none"> <li>▪ Development &amp; Building Control</li> </ul>	<p>Ensuring issues of land contamination are addressed within planning applications; advice on historic planning issues; ensure contaminated land issues arising within the building control regime are identified and addressed.</p>
<ul style="list-style-type: none"> <li>▪ Environment</li> </ul>	<p>Advice on building receptors with archaeological importance.</p>
<ul style="list-style-type: none"> <li>▪ European &amp; Strategic Planning</li> </ul>	<p>Support and development of the contaminated land GIS; provision and maintenance of existing GIS databases utilised in the Inspection Strategy; advice on issues of sustainable development and Agenda 21; advice on environmental receptors of national and international importance.</p>
<b>Property &amp; Architectural Services</b>	
<ul style="list-style-type: none"> <li>▪ Property</li> </ul>	<p>Provision and maintenance of the Highland Council's corporate property database; identification of land contamination issues and consideration of liabilities and obligations with regard to the Highland Council's property and estates.</p>
<b>Cultural &amp; Leisure Services</b>	
<ul style="list-style-type: none"> <li>▪ Archivist</li> </ul>	<p>Advice on historical archive information held within the Council.</p>
<b>Chief Executive's</b>	
<ul style="list-style-type: none"> <li>▪ Policy</li> </ul>	<p>Consideration of the Inspection Strategy within corporate policies and relationships with organisations in established partnerships.</p>
<b>Corporate Services</b>	
<ul style="list-style-type: none"> <li>▪ Legal Services</li> </ul>	<p>Advice regarding legal interpretation of the statutory regime; representation and provision of advice in respect of Council and Service liabilities and obligations, particularly regarding sale or transfer of land and property.</p>
<b>Protective Services</b>	
<ul style="list-style-type: none"> <li>▪ Environmental Health</li> </ul>	<p>Management of development and implementation of the Inspection Strategy; statutory regulation; external liaison regarding the contaminated land regime; provision of public health and environmental protection information.</p>
<ul style="list-style-type: none"> <li>▪ Waste (Strategy)</li> </ul>	<p>Provision of information and advice on historic land filling.</p>
<b>Finance Service</b>	
	<p>Advice regarding financial implications of the strategic response to the contaminated land, council obligations and its regulatory role.</p>

## **3.4 Information Management**

- 3.4.1 Information currently being gathered, with regard to the contaminated land regime, is in electronic and digital formats, paper records and maps. A system of management of this information is an essential pre-requisite to the implementation of the strategy, and demonstrates an ordered and efficient approach to the regime.
- 3.4.2 A system of electronic management of contaminated land information requires a mapping facility and a database, a means of establishing and recording the quality of any specific information, and a provision for carrying out screening assessments and risk evaluation.
- 3.4.3 A Geographical Information System (GIS) is being developed within the service. The GIS will incorporate a mapping facility and an integrated database to be used for the management of data generated for use in the contaminated land regime. The system will allow interrogation for statistical report generation and incorporate an appropriate risk rating system. This system will allow a risk-based screening of sites and assist in prioritisation of site inspection. The GIS will also include a facility for storing information on the provenance and quality of the datasets and sources being utilised. Cross-referencing with existing archives and integration with existing electronic databases will also be achieved.
- 3.4.4 Access to the GIS will be limited to Headquarters' staff with contaminated land responsibilities and GIS support and management staff. As the system is developed it may be appropriate to broaden access to the GIS for information, to other Protective Services and Planning and Development staff.
- 3.4.5 A series of screening and risk evaluating steps will require to be applied to data within the GIS to identify sites of highest priority and those where contaminated land is most likely to be found. These are described in section 3.7 to this report

## **3.5 Pollutant Linkage**

### 3.5.1 Sources of Contamination

3.5.1.1 The following section outlines the sources of contamination most likely to be considered as important within The Highland Council area.

#### 3.5.1.2 Historical industrial land use

Locally important industries with the likeliest contamination profile include:

- Gasworks
- Petrochemical production and storage
- Organic and inorganic chemical production
- Animal slaughter and by products processing
- Metal smelting and refining
- Scrapyards
- Engineering and fabrication
- Energy production and generation
- Timber treatment
- Garages, including depots, sale and storage of fuels and vehicle repair
- Railway land
- Textile manufacture and dyeing
- Dockyards wharves and airports

3.5.1.3 A number of ranking and risk rating systems have been developed with regard to potential for industries to pollute or contaminate land. These are being considered for use in screening and risk evaluation procedures to be utilised within The Highland Council's contaminated land GIS.

#### 3.5.1.4 Historic landfill

Sites where a variety of materials with the potential to act as contaminants have been disposed of or where they may have been used in landscaping can act as important sources of contamination. A review of existing information regarding such land use within the Council is being undertaken and additional sites are likely to be identified through examination of historic maps and dialogue outwith the Council. Such sites will receive a ranking or risk rating within assessment procedures being developed for historical industrial land use as discussed above.

#### 3.5.1.5 Quarries

Initial examination of historic maps has revealed a very high number of quarry and material extraction sites across the Highlands. Many such sites in themselves will present little risk. What is of more concern is the nature and provenance of material which may have been tipped or dumped into them, or have been used to fill or landscape them. As such materials may present a source of contaminants, site proximity to a variety of receptors may form an important element in potential pollutant linkage. A method of assessing these potential sources is currently being considered within the Councils contaminated land GIS.

#### 3.5.1.6 Redevelopment

Sources of contamination, which may form an element of pollutant linkages as a result of previous redevelopment, require to be considered within the inspection strategy. Such issues are discussed within the sources of information section.

#### 3.5.1.7 Natural

Natural sources of contamination, resulting from naturally occurring, elevated levels of chemicals or compounds will be considered. Such information is available from the BGS or MLURI.

#### 3.5.1.8 Current industrial land use

Current industrial land use, highlighted in contemporary maps, local plans and process authorisations may indicate potential historic industrial land use and potential sources of contamination. Such information will be collated and utilised within the assessment procedures developed within the Councils contaminated land GIS

#### 3.5.1.9 Military

The Highland Council area has had a long association with various sectors of the military establishment; military bases, fuel and weapons depots, ranges, airfields and training areas may contain historic contaminants, which require consideration within the strategy. Identification of sites is being explored through a number of avenues.

### 3.5.2 Pathways

3.5.2.1 Direct exposure of human populations with proximity to sources, through inhalation dermal contact and ingestion pathways will be considered as the highest priority within the implementation of the contaminated land regime.

3.5.2.2 Water resources utilised as public and private water supplies have the ability to transmit contaminants either by contamination at source or through distribution. In consequence water supplies will be considered as important potential pathways to human receptors. Internal liaison within Highland Council Protective Services with its regulatory role in private water supplies, and externally with NOSWA will be important in identifying such potential pathways and assessing any impact on the human population.

3.5.2.3 The produce of agriculture, fisheries and aquaculture when incorporated in the human food chain may convey contaminants to the human population and thus may be important pathways within pollutant linkage. Similarly certain commercial uses of water resources, both indirectly and directly, may introduce a pollutant linkage within the human food chain.

3.5.2.4 Such issues will require liaison within the Highland Council Protective Services with its regulatory role in food safety, and externally with the Food Standards Agency (FSA) SEERAD, and The Highland Health Board, both in identifying contaminative hazards and assessing the risks they present.

3.5.2.5 Similarly the potential use of private gardens and allotments for growing food for human consumption will be an important consideration in identifying potential pathways in areas with suspected contamination.

3.5.2.6 Both solid and drift geology exposed to particular sources of contamination may allow transmission of contaminants, either as liquids (or in solution), and as gasses. Geology may act as a pathway for a variety of receptors ranging across controlled waters, property, and environmental and human receptors. In site specific assessments, geological expertise may have to be employed by the council to assess the significance of such a pathway.

### 3.5.3 Receptors

3.5.3.1 Population density has been mapped across The Highland Council area. Further clarification of information within this dataset to identify particularly sensitive population categories and characteristics, is being considered. Such more refined information will be mapped within the database when it becomes available. The human population of Highland Council area is considered within this strategy as the highest priority receptor. The proximity of the human receptors to a number of identified potential sources of contamination will be considered within the strategy as an initial screening step in the identification of contaminated land.

- 3.5.3.2 Surface waters have been mapped across the Highlands for inclusion within the contaminated land database. NOSWA has been consulted on important catchments for public water supply, and requested to provide this as digital information for inclusion within the contaminated land database. A process of mapping the private water supplies across Highland is being developed for inclusion within the database.
- 3.5.3.3 Information on ground water vulnerability has been provided by BGS and its incorporation within the contaminated land database is being investigated.
- 3.5.3.4 SEPA, within its general responsibility for protecting the water environment, has been consulted on the controlled waters it considers as particularly important by virtue of their value, use or vulnerability. Such information will be of particular value when considering the priority of controlled waters during investigation and inspection within the regime.
- 3.5.3.5 Spatial mapping of specified ecological systems already exists within a Highland Council GIS database. The information has been provided by SNH and will be imported into the contaminated land database.
- 3.5.3.6 Similarly spatial information regarding scheduled ancient monuments is also available for importation into the contaminated land database. Historic Scotland has provided this information.
- 3.5.3.7 Consideration is being given to mapping areas containing property receptors other than buildings. These include land associated with forestry and agriculture, important fisheries and locations of sites of fish and shellfish farms. Priority in such mapping will be given to those directly involved in food production.
- 3.5.3.8 Evidence of actual harm to specified receptors, will be examined within collated information and information resulting from site investigations, and compared against the descriptions of significant harm and significant possibility of significant harm contained within the statutory guidance (Appendices I & II). Issues relating to the pollution of controlled waters will be viewed in light of statutory guidance and discussed with SEPA. Where such issues arise they will be viewed by The Highland Council within the Scottish Executives objectives for sustainable development, and elements of the “suitable for use” approach highlighted in section 1.3 of this report.

## **3.6 Sources of Information**

### **3.6.1 Internal sources**

3.6.1.1 The Highland Council will utilise a variety of sources of information in identifying receptors, sources and pathways, and assessing pollutant linkages in its strategic approach to the regime.

3.6.1.2 Identification of potentially contaminated sites from historic land uses will require examination of historical maps. Ordnance Survey County Series and National Grid archive maps have been digitised and are commercially available. These digital maps allow a more efficient examination of historic spatial information and can be formatted to integrate directly with GIS. The purchase and use of these maps is an essential element in strategy implementation.

3.6.1.3 Data and information on sites, arising from a number of sources, are currently held on both paper based and electronic systems within the Council. The Council, in its many functions, holds a variety of registers, lists and databases which contain information relevant to the inspection strategy. Individual Services within the council are reviewing this information and its potential use within the contaminated land regime. Such information includes individual site reports, reports of investigations carried out in relation to proposed developments, reports and assessments submitted in support of planning and licensing applications, reports on specific land uses and processes.

3.6.1.4 The Council has also inherited a variety of historical information and records from its antecedent authorities. Some of this archive material relates to issues such as public health reports, planning control and land interests, which may be of value in assessment of redevelopment and site investigations.

3.6.1.5 Information on known contamination, previous site redevelopment and actions already taken to deal with land contamination within The Highland Council area, is associated with site remediation in relation to pollution incidents, site rehabilitation and sites considered within the Development Control process, prior to the Contaminated Land (Scotland) Regulations coming into force. Identification of such sites may be highlighted within the data gathering exercise and examination of land use in historic maps. However liaison within the Council, with development and industrial interests and other regulatory bodies, will be necessary to identify the extent of remediation and the priority such sites receive in the implementation of the regime.

3.6.1.6 In addition many current and previous staff members have a wide knowledge of local and historic land use, which is invaluable in identifying potentially contaminated sites. Staff will be encouraged to contribute such information through a number of internal channels. Where appropriate, former staff will be invited to contribute to this knowledge gathering exercise.

3.6.1.7 All such material utilised in the contaminated land regime will be integrated directly or cross-referenced with the contaminated land GIS.

### 3.6.2 External Sources

3.6.2.1 Other external organisations hold registers and information, which will also be valuable in enabling The Highland Council to identify potentially contaminated sites. These include SEPA, the Scottish Executive, SNH, Historic Scotland, and the Ministry of Defence and owners of large estates such as the utility companies, Forestry Enterprise, Scotrail and Statutory Enterprise Bodies. Appropriate links will be established with such organisations to ensure efficient liaison, consultation and transfer of information.

3.6.2.2 Spacial information on the geology and hydrology of The Highland Council area will be vital in determining pollutant linkage and assessing potentially contaminated sites. Currently such information held by the Council is in the form of paper maps, however The Highland Council will consider the purchase of electronic information as and when they become available in digital format.

### 3.6.3 Information Provided by the Public

3.6.3.1 This is recognised as being an important source of information, as certain members of the public will be in possession of information that is not likely to be common knowledge. Information on unauthorised or historic land uses may be well known within the immediate locality but be completely unknown within the local authority. History groups and amateur historians may also be able to provide information on the development of their local areas. The Council will encourage the participation of the public within the implementation process, and will welcome information they provide.

3.6.3.2 The Council will appreciate information from all sources, but it should be noted that it can only act on information that can be verified or withstand robust scrutiny. Anecdotal information will be noted and assessed at the discretion of the appropriate officer.

3.6.3.3 All information providers will be requested to supply their names and contact details. Their identities will, as far as practicable, remain confidential.



## 3.7 Prioritisation

3.7.1 In preparing their inspection strategies Local Authorities have to assess and determine methods of prioritising areas for inspection and for the inspection of individual sites. Inspection priorities must reflect the application of principles set out in the statutory guidance and ensure their approach:

- be rational, ordered and efficient;
- be proportionate to the seriousness of any actual or potential risk;
- seek to ensure that the most pressing and serious problems are located first;
- ensure that resources are concentrated on investigating in areas where the authority is most likely to identify contaminated land; and
- ensure that the local authority efficiently identifies requirements for the detailed inspection of particular areas of land.

3.7.2 Statutory guidance indicates that each authority, in determining its individual priorities for inspecting its area, should take into account the particular circumstances of its area. These circumstances may be influenced by historic industrial and other potentially contaminative land use activities, the areas geographic and demographic mix, and may reflect the authority's broader objectives in such fields as economic development, land management, public health and environmental protection.

3.7.3 Information management and evaluation systems are being developed to allow screening of sites and identification of those requiring more site-specific investigation. The priority such site-specific investigations receive will reflect analysis of hazard, an assessment of risk and the adoption of The Highland Councils own strategic priorities. There will be an over riding consideration given to risk to human health within the inspection strategy and its implementation.

3.7.4 Areas to be prioritised for inspection within the strategy are those:

- with historic potential contaminative land use,
- with high population density,
- not considered within supported redevelopment areas (e.g. areas designated within the settlement strategy, local plans or simplified planning zones, see sections 2.5.1 & 2.5.7 to this document),
- containing high value environmental receptors,

- important in food production,
- containing valuable historic sites,
- associated with valuable and vulnerable water resources,
- with important established pathways,
- important in maintaining, supporting and sustaining the varied Highland economy, particularly in relation to the area's high environmental quality
- highlighted as particularly pressing, but identified outwith the implementation of the inspection strategy (e.g. by external agencies in the performance of their duties within complementary regulatory regimes: HSE, SEPA, FSA etc)

### **3.8 Procedures for Identifying and Prioritising Sites**

3.8.1 The Highland Councils scheme for identifying and prioritising areas of land for inspection will incorporate a number of stages:

- 1. Data collation and information gathering**
- 2. Identification of potential sources**
- 3. Screening of potential sources against receptors**
- 4. Assessment of pollutant linkage**
- 5. Allocation of priority**
- 6. Inspection and decision**

3.8.2 This scheme will ensure that areas of land which merit more detailed inspection, either in that they represent the most pressing or serious sites or are areas where contaminated land is most likely to be found, will be investigated on a more detailed or site specific basis.

3.8.3 The Council will utilise a GIS as a management and interrogation tool within this process, incorporating appropriate ranking and evaluation methodologies at each stage. As risk will vary depending on the nature of the pollutant linkage, the value and vulnerability of the receptor(s), and the extent of the impact of the contamination source, ranking or priority scoring methodologies must reflect these.

3.8.4 There are a number of commercially available software packages designed to carry out these tasks. These are currently being assessed for use within the contaminated land GIS. There is also the possibility of developing an in-house system which may include adapted elements of a commercially available package.

**Stage 1.** This stage will consider sources of information described in sections 3.5.1, 3.5.2, 3.5.3 and 3.5.4 of this document, and will involve collection and collation of this information, and its input and incorporation within the GIS.

**Stage 2.** This stage involves identification of potential sources within information gathered in Stage 1. Methodologies for ranking or scoring these sources with regard to their associated hazards, and the risks they represent, are currently being assessed for use within the GIS. In the interim a categorisation has been adopted which is based on land use classification and provides an index of perceived risk. This categorisation has been developed from the Desk Reference Guide to potentially Contaminative Land Uses ( Syms 1999) and is based on both the likely hood and nature of contaminative substances which may be present. The perceived risk category is intended to indicate the likelihood of presence of contaminative substances at concentrations, which would result in “significant harm” being caused or pollution of controlled waters.

**Stage 3.** This stage involves a screening of land categorised in Stage 2 against receptors specified in the statutory guidance, and incorporated in the GIS at Stage 1. This will be carried out using a proximity screening tool in the GIS.

**Stage 4.** In this stage the existence of potential pollutant linkage will be evaluated in relation sources and receptors occurring within proximity identified in Stage 3 using information on possible pathways discussed in section 3.6 to this document.

**Stage 5.** Within this stage, areas of land identified in Stage 3 as having a potential pollutant linkage, demonstrated in Stage 4, will have the significance of this linkage assessed for priority consideration. A methodology for such assessment will either be purchased as a software package or developed in-house, for use within the GIS. This will incorporate:

- Classification of potential sources; the index of perceived risk allocated to sources in Stage 2, (or its adopted equivalent)
- Classification of priority allocated to receptors, which are identified in section 3.4.5 to this document.
- The potential existence of pollutant linkage highlighted in Stage 4

**Stage 6.** Decisions regarding land inspections will be made at this stage.

- 3.8.5 When priority has been allocated through Stage 5 to areas of land, inspection decisions will be made. These will assess, whether existing information is adequate to determine the land as contaminated land, identify further information requirements, which would allow such determination, and whether the services of consultants should be commissioned in site investigation.
- 3.8.6 Once adequate information has been gathered with regard to priority sites, site specific risk assessment will be applied to enable ultimate decisions on whether sites can be considered as contaminated land to be made. In carrying out this final step The Highland Council will have regard to the following:
- statutory guidance within SERAD Circular 1/2000,
  - a number of frameworks and standards for the investigation of contaminated land \*, and
  - available and anticipated risk based methodologies for the assessment of contamination \*.

(\* for examples see bibliography)

- 3.8.7 Areas of land identified outwith this procedure by The Highland Council, or brought to the Councils attention by complaint or by external organisations will be considered within the appropriate stage of this procedure, depending on the extent of existing information, or information provided.

## **3.9 Internal Procedures**

### **3.9.1 Complaints and Service Requests**

- 3.9.1.1 Complaints or service requests will be dealt with initially by Protective Services officers within the appropriate area office in liaison with the Principal Protective Services Officer (Contaminated Land) (PPSO.CL). The Area Protective Services Officer, in conjunction with the PPSO.CL will determine whether the contaminated land regime is applicable. When situations arise which require more onerous or specialised involvement or have a greater strategic significance the PPSO.CL may consider a more direct role although every effort to involve local area staff will be made.

3.9.1.2 The Highland Council has a computer database for dealing with a wide range of council business. This database already has a facility for dealing with complaints, which can be adapted to deal with contaminated land issues. Complaints or service requests will be logged and updated within the Protective Services existing electronic recording system by the appropriate area officer, and will be subject to the same standards of Service delivery as are currently adopted. Every effort will be made to resolve complaints quickly and efficiently, and to keep the complainant informed of progress.

3.9.1.3 Any anonymous complaint or information received relating to contaminated land will be processed to a degree considered necessary according to the circumstances. No extensive investigations will be undertaken unless there is supporting evidence of contamination from historical or non-intrusive examination of the site.

3.9.1.4 All complainants / information providers will be requested to supply their names and contact details. The identities of all complainants and information providers will, as far as practicable, remain confidential.

### 3.9.2 Interaction with Planning and Building Control Regimes

3.9.2.1 Land contamination can be addressed by the planning system in terms of its strategic policy framework and when individual applications are considered as part of the development control process. In relation to the determination of planning applications, land contamination may be regarded as a “material consideration”. Land contamination should also be considered as a factor in the preparation of development plans. Guidance regarding issues of land contamination and the planning process is available for planning authorities in Planning Advice Note 33 (revised 2000) Development of Contaminated Land. Although the contaminated land regime and planning system run in parallel, and are administered through different Services within The Highland Council, land contamination issues will require interaction between Services. The way such issues are addressed within the planning system features as an element in the Council’s Inspection Strategy.

3.9.2.2 An important distinction exists between issues of land contamination raised in terms of Part IIA (contaminated land regime) and those associated with the planning system and development control. It is the responsibility of the planning authority to consider the potential risks from development works, and proposed use, as well as considering existing contamination risks, associated with development. The contaminated land regime only considers contamination issues in terms of risk within the context of existing use. There are likely to be instances, therefore, where issues of land contamination on a particular site will fall outwith the contaminated land regime, by virtue of the statutory definition of “contaminated land”, yet remain issues within development control.

- 3.9.2.3 Discussions, regarding issues of land contamination relating to development plans, and the strategic policy framework of the planning system, will take place within the Contaminated Land Working Group.
- 3.9.2.4 Issues of land contamination arise within the development control process at the planning consultation stage. In practice such issues are given consideration by Protective Services' Area Offices. Due to the interaction between the contaminated land regime and development control, and the requirement for land contamination to be considered strategically, it is essential that a procedure be implemented to ensure such issues be highlighted within applications and that such information be effectively managed within Protective Services.
- 3.9.2.5 Simply centralising this function would not have been desirable, either in terms of service provision or in terms of the principle of subsidiarity. Area Protective Services officers retain a wealth of local knowledge and contact networks, which are invaluable in tracing the history, and formulating a contamination profile of any site. This local knowledge is considered important in identifying potentially important sites and provides a valuable additional input to this process.
- 3.9.2.6 Procedures have been developed to ensure that certain land contamination issues are highlighted within the development control process, and that appropriate comment is made at local area level. Such information will also be managed in terms of the contaminated land regime. These procedures involve liaison between both Protective Services and Planning & Development staff and the PPSO.CL on a routine and operational basis. These procedures will be routinely reviewed to ensure they work properly.
- 3.9.2.7 Where a proposed development comes within the remit of the Building Control Service, issues of land contamination shall be addressed in terms of the Building Standards (Scotland) Regulations 1990. Technical Standards made under these Regulations ensure that measures are taken to protect people and buildings from harm which could be caused by site conditions. Procedures have been developed to make sure that Protective Services are notified where these issues arise or where Building Control officers in the course of their duties identify unforeseen land contamination issues.
- 3.9.2.8 Communication both within and between council services, about land contamination issues arising as a result of applications within the development and building control processes have been formalised through The Highland Council's (Officers') Contaminated Land Working Group, to ensure an ordered and efficient approach.
- 3.9.2.9 Information, consultants' reports and other supporting documentation submitted with planning applications are available in the public domain, such information cannot therefore be treated as confidential and will be used in compiling information on specific sites.

### 3.9.3 Information Requests

- 3.9.3.1 The Highland Council holds a variety of sources of information and, in the process of strategy implementation, will generate a considerable amount of further information, regarding land condition. Some of this relates to the implementation of the contaminated land regime, including the register of contaminated land, whilst much of it relates to the Council's involvement in other statutory regimes. Information on land use and land condition has a commercial value within the context of the development and transfer of land and property, and assessment of potential liabilities. As a result, and with increasing frequency, the Council receives requests for information on land use and land condition from the commercial sector, interested groups and organisations, and members of the public.
- 3.9.3.2 The Council recognises it has an important role in relation to the provision of this type of information. However there are important resource implications in such provision. In addition there are issues of confidentiality, data protection, access to information and human rights, in the request and provision of information. Such issues will be addressed within Highland Council's Contaminated Land Working Group and will receive particular scrutiny by Legal Services.
- 3.9.3.3 The Council will continue to provide information in response to enquiries as they arise, and will meet any resource implication with an appropriate charge. Although considered, it was not felt appropriate to incorporate such requests within the existing Property Enquiry service.
- 3.9.3.4 As stages within the implementation of the strategy are addressed, reports on the outcome and results of these investigations will be produced outlining the extent of screening, their conclusions and their recommendations. Information, on specific sites identified within the screening stages, site specific investigations and resulting actions, will be reported. Such reports will be available for performance assessment, although some information they contain will be confidential and access to them will be considered within the constraints discussed above.

## **3.10 Communications**

- 3.10.1 The development, publication and implementation of Highland Council's Contaminated Land Strategy requires the formation and use of direct lines of communication within and outwith the Council. Internal communication within the Council between officials, Services and members, has progressed through a Contaminated Land Working Group and elected members have been advised through Committee reports.
- 3.10.2 To facilitate the development and implementation of the Inspection Strategy, Highland Council will liaise and consult with a number of bodies and organisations in established partnerships and working groups. These include the Scottish Executive, SEPA, neighbouring local authorities, Highland Health Board, Highland and Island Enterprise and Local Enterprise Companies, Historic Scotland, SNH, NOSWA and the BGS.
- 3.10.3 Communication between local authorities regarding interpretation of the legislation and guidance, development of inspection strategies, and implementation of the regime, occurs through the network of pollution liaison groups, co-ordinated by the Scottish Pollution Control Co-ordinating Committee (SPCCC), and through working groups hosted by COSLA.
- 3.10.4 Direct and effective communication with SEPA is essential in implementing the contaminated land regime in the Highlands. This is so because SEPA is a source of site-specific advice and because of its complementary regulatory role and with its responsibility for compiling the state of contaminated land report. Initial discussions have taken place, and in consultation with local authorities, SEPA has published a framework for liaison (Framework for Local Authority- SEPA Liaison under Part IIA). Although there is no formal adoption of this framework, Highland Council will use it where appropriate. Highland Council will maintain both formal and informal contact with SEPA regarding issues arising from development and implementation of its strategic role in the contaminated land regime.
- 3.10.5 In addition a number of organisations have expressed an interest in the Council's strategy. These organisations will be included in the draft strategy consultation process. A list of bodies and organisations receiving consultation drafts of the Council's Inspection Strategy is given in Table 5



Table 5. The Highland Council Contaminated Land Inspection Strategy Consultees

Food Standards Agency	Neighbouring Local Authorities;	Highlands and Islands Enterprise
Friends of the Earth (Scotland)	Argyll & Bute Council	
Highland Health Board	Comhairle Nan Eilean Siar	
Historic Scotland	Moray Council	
Local Enterprise Companies	Orkney Islands Council	
North of Scotland Water Authority	Perth & Kinross	
Scottish Environment Protection Agency		
Scottish Executive		

3.10.6 Additional consultation drafts will be available for individuals and organisations on request and the published strategy will be available on the Council’s Intranet and Internet website.

3.10.7 Early and informal discussions with the owners and occupiers of sites considered in the implementation of the inspection strategy is essential in establishing site contamination profiles, communicating issues with potentially responsible individuals and organisations, and promoting voluntary remediation.

3.10.8 Importantly The Highland Council will require to use the expert services of contractors and consultants for site investigation, assessment and interpretation, and potentially remediation. The Councils retained consultant is already carrying some assessment functions. However it is likely that as the implementation of the regime gets underway, and priority sites start to be identified, additional expertise will be required. It is essential that lines of communication are established with companies that have the professional expertise and experience, incorporating verifiable quality control accreditation’s and show ability to address specific requirements of the contaminated land regime, specifically in relation to site investigation, pollutant linkage and risk assessment.

### 3.11 Timescales and Review

3.11.1 The setting of objectives require an indication of the time period within which these objectives will be achieved. Statutory guidance indicates that local authorities should include in their strategies appropriate timescales for the inspection of different parts of their area.

- 3.11.2 However within the contaminated land regime there are many uncertainties. There are no comprehensive estimates of the extent of contaminated land within The Highlands (or indeed in Scotland), and there are major resource implications for the development, management and implementation of the inspection strategy. It is also difficult to estimate the time tasks such as information gathering are likely to take, particularly where archived materials are involved or information has been requested from other organisations or agencies outwith the council. The setting of arbitrary timescales and deadlines for completing the various elements of the strategy and its objectives could therefore be misleading and unhelpful.
- 3.11.3 Possibly the most appropriate statement on the issue of timescales for inspection of the different parts of the area would be to indicate that an initial screening of the major population areas would be completed prior to the first strategy review (April 2002). At that stage an assessment of the timescales for further implementation will be made. In addition such screening will commence prior to the publication of this strategy (October 2001) and that procedures for the identification of priority sites will be initiated prior to the first annual review (April 2003).
- 3.11.4 A tentative provisional timetable for addressing a number of objectives and priorities over a five-year period is provided in Appendix V. These timescales for the most part should be considered in relation to previous statements and will be subject to review and revision as information collation proceeds, the GIS is developed and the inspection strategy is implemented.
- 3.11.5 This document represents the first attempt to provide a strategic response for The Highland Council to the issues of land contamination and the contaminated land regime. It is unlikely that the strategy at this stage can identify the full range of issues, which it will require to address as the council implements its response to the regime.
- 3.11.6 Rather it will provide a framework around which policies, procedures and management systems will be developed and reviewed. The strategy will have to be adaptive, perhaps having to address unforeseen issues and incorporate further changes in guidance.
- 3.11.7 It is envisaged that the strategy will be subject to routine review to ensure that it reflects the current guidance, that it adequately addresses the range of contaminated land issues and provide updates on information collation and management, and implementation of regime. Initially such a review is planned around 6 months from publication of the strategy (April 2002); from then on it may be appropriate for an annual review to be undertaken
- 3.11.8 Although this will not preclude unplanned reviews should situations arise which require amendments or alterations of the strategy.

**SERAD Circular (1/2000) Annex 3- Statutory Guidance, Part 3  
Table A- Categories of Significant Harm**

	<b>Type of Receptor</b>	<b>Description of harm to that type of receptor that is to be regarded as significant harm</b>
1	<b>Human beings</b>	<p>Death, disease, serious injury, genetic mutation, birth defects or the impairment of reproductive functions.</p> <p>For these purposes, disease is to be taken to mean an unhealthy condition of the body or a part of it and can include, for example, cancer, liver dysfunction or extensive skin ailments. Mental dysfunction is included only insofar as it is attributable to the effects of a pollutant on the body of the person concerned.</p> <p>In this Chapter, this description of significant harm is referred to as a “human health effect”.</p>
2	<p>Any ecological system, or living organism forming part of such a system, within a location which is:</p> <ul style="list-style-type: none"> <li>• an area notified as an area of special scientific interest (commonly called a site of special scientific interest – SSSI) under section 28 of the Wildlife and Countryside Act 1981;</li> <li>• any land declared a national nature reserve under section 35 of that Act;</li> <li>• any area designated as a marine nature reserve under section 36 of that Act;</li> <li>• an Area of Special Protection for Birds, established under section 3 of that Act;</li> <li>• any European Site within the meaning of regulation 10 of the Conservation (Natural Habitats etc) Regulations 1994 (i.e. Special Areas of Conservation and Special Protection Areas):</li> <li>• any candidate Special Areas of Conservation (see Scottish Office Circular 6/1995) or potential Special Protection Areas given equivalent</li> </ul>	<p>For any protected location:</p> <ul style="list-style-type: none"> <li>• harm which results in an irreversible adverse change, or in some other substantial adverse change, in the functioning of the ecological system within any substantial part of that location; or</li> <li>• harm which affects any species of special interest within that location and which endangers the long-term maintenance of the population of that species at that location.</li> </ul> <p>In addition, in the case of a protected location which is a European Site (or a candidate Special Protection Area of Conservation or a potential Special Protection Area), harm which is incompatible with the favourable conservation status of natural habitats at that location or species typically found there.</p> <p>In determining what constitutes such harm, the local authority should have regard to the advice of Scottish Natural Heritage and to the requirements of the Conservation (Natural Habitats etc) Regulations 1994.</p> <p>In this Chapter, this description of significant harm is referred to as an “ecological system effect”.</p>

	<p>protection;</p> <ul style="list-style-type: none"> <li>any habitat or site afforded policy protection (i.e. candidate Special Areas of Conservation, potential Special Protection Areas and listed Ramsar sites);</li> <li>any nature reserve established under section 21 of the National Parks and Access to the Countryside Act 1949; or</li> <li>any candidate National Park to be designated under the proposed National Parks Act.</li> </ul>	
3	<p>Property in the form of:</p> <ul style="list-style-type: none"> <li>crops, including timber;</li> <li>produce grown domestically, or on allotments, for consumption;</li> <li>livestock;</li> <li>other owned or domesticated animals;</li> <li>wild animals, which are the subject of shooting, or fishing rights.</li> </ul>	<p>For crops, a substantial diminution in yield or other substantial loss in their value resulting from death, disease or other physical damage. For domestic pets, death, serious disease or serious physical damage. For other property in this category, a substantial loss in its value resulting from death, disease or other serious physical damage.</p> <p>The local authority should regard a substantial loss in value as occurring only when a substantial proportion of the animals or crops are dead or otherwise no longer fit for their intended purpose. Food should be regarded as being no longer fit for purpose when it fails to comply with the provisions of the Food Safety Act 1990. Where a diminution in yield or loss in value is caused by a pollutant linkage, a 20% diminution or loss should be regarded as a benchmark for what constitutes a substantial diminution or loss.</p> <p>In this Chapter, this description of significant harm is referred to as an “animal or crop effect”.</p>
4	<p>Property in the form of buildings.</p> <p>For this purpose, “building” means “any structure or erection, and any part of a building including any part below ground level, but does not include plant or machinery comprised in a building”.</p>	<p>Structural failure, substantial damage or substantial interference with any right of occupation.</p> <p>For this purpose, the local authority should regard substantial damage or substantial interference as occurring when any part of the building ceases to be capable of being used for the purpose for which it is or was intended.</p> <p>Additionally, in the case of a scheduled Ancient Monument, substantial damage should be regarded as occurring when the damage significantly impairs the historic, architectural, traditional, artistic or archaeological interest by reason of which the monument was scheduled.</p> <p>In this Chapter, this description of significant harm is referred to as a “building effect”.</p>

**SERAD CIRCULAR (1/2000) ANNEX 3 – STATUTORY GUIDANCE, PART 3**  
**TABLE B – Significant possibility of significant harm**

	<b>Descriptions of Significant Harm (As Defined in Table A)</b>	<b>Conditions for there being a Significant Possibility of Significant Harm</b>
1	<p>Human health effects arising from</p> <ul style="list-style-type: none"> <li>• The intake of a contaminant, or</li> <li>• other direct bodily contact with a contaminant (exposure)</li> </ul>	<p>If the amount of the pollutant in the pollutant linkage in question:</p> <ul style="list-style-type: none"> <li>• which a human receptor in that linkage might take in, or</li> <li>• to which such a human might otherwise be exposed, as a result of the pathway in that linkage would represent an unacceptable intake or exposure, assessed on the basis of relevant information on the toxicological properties of that pollutant.</li> </ul> <p><b>Such an assessment should take into account:-</b></p> <ul style="list-style-type: none"> <li>• the likely total intake of, or exposure to, the substance or substances which form the pollutant, from all sources including that from the pollutant linkage in question ;</li> <li>• the relative contribution of the pollutant linkage in question to the likely aggregate intake of, or exposure to, the relevant substance or substances; and</li> <li>• the duration of intake or exposure resulting from the pollutant linkage in question.</li> <li>• The question of whether an intake or exposure is unacceptable is independent of the number of people who might experience or be affected by that intake or exposure.</li> </ul> <p>Toxicological properties should be taken to include carcinogenic, mutagenic, teratogenic, pathogenic, endocrine-disrupting and other similar properties.</p>
2	<p>All other human health effects (particularly by way of explosion or fire).</p>	<p>If the probability, or frequency, of occurrence of significant harm of that description is unacceptable, assessed on the basis of relevant information concerning:</p> <ul style="list-style-type: none"> <li>• that type of pollutant linkage, or</li> <li>• that type of significant harm arising from other causes.</li> </ul> <p>Such an assessment should take into account the levels of risk, which have been judged unacceptable in other similar contexts.</p>
3	<p>All ecological system effects</p>	<p>If significant harm of that description is more likely than not to result from the pollutant linkage in question, taking into account relevant information for that type of pollutant linkage, particularly in relation to the ecotoxicological effects of the pollutant.</p>
4	<p>All animal and crop effects</p>	<p>If significant harm of that description is more likely than not to result from the pollutant linkage in question, taking into account relevant information for that type of pollutant linkage, particularly in relation to the ecotoxicological effects of the pollutant.</p>
5	<p>All building effects</p>	<p>If significant harm of that description is more likely than not to result from the pollutant linkage in question during the expected economic life of the building (or, in the case of a scheduled Ancient Monument, the foreseeable future), taking into account relevant information for that type of pollutant linkage.</p>

SUMMARY OF THE QUATERNARY GEOLOGY AND HYDROGEOLOGY  
OF THE HIGHLAND COUNCIL AREA

C A Auton &amp; D F Ball

The spectacular mountains and glens of the Scottish Highlands that we see today have largely resulted from the wearing away of ancient resistant bedrock by the action of ice and running water. In common with most of Northern Britain, Highland Region has been glaciated many times since the youngest bedrock strata were laid down. This glacial activity has occurred during the past 2 million years or so, but most of the glacial sediments that now cover the ground, were laid down by an ice sheet that reached its maximum size about 20 000 years ago. During this glaciation the Highlands were covered by ice that, in places, exceeded a kilometre in thickness. Scouring by this 'Main Late Devensian' ice has largely removed the traces of earlier material, though small isolated pockets of older glacial sediments are sometimes preserved in bedrock hollows. These are mainly found in the east of the region, at sites distant from the ice accumulation centres in the western mountains. This major glaciation ended about 13 000 years ago. After the ice had disappeared, much of the lower lying ground was covered by tundra vegetation and eventually by woodlands of pine and birch.

The most widespread deposit laid down directly from the ice was glacial till or 'boulder clay'. It normally rests on bedrock, covers much of low ground around the coast and extends into the upland valleys. The till generally consists of cobbles, boulders and pebbles (often mainly of the underlying bedrock) mixed with clayey sand and silt (formed of 'rock flour' ground-up by the ice). Most Highland till is sandy or gritty, and hence more permeable than similar deposits in southern Britain which contain more clay. Nevertheless, as the tills are relatively hard compact materials, that were compressed beneath ice, they comprise some of the least permeable of the Quaternary formations in the Highland area.

Mounds and ridges of bouldery gravel, mixed with till, were laid down as moraines at the margins of valley glaciers as the ice sheet retreated. These moraines are now widespread in the upland valleys in areas such as the western Grampian Mountains, the Cairngorms and the North West Highlands. The deposits forming the moraines are generally more variable, both in thickness and composition, than the till. They are generally loose, sandy, permeable sediments, that tend to collapse when excavated to more than a few metres depth.

Many moraines on the western side of Highland Region formed during a second glacial episode, which occurred between 10 000 and 11 000 years ago. During this 'Loch Lomond' glaciation, an ice cap developed in the western Grampian Mountains and extended over about half of the North West Highlands. A smaller ice cap also developed in the Cullins on Skye. These glaciers removed or reworked much of the glacial sediment laid down during the earlier 'Main' glaciation, to form moraines that rest directly on ice-scoured bedrock. During this last brief period of Arctic climate, frost shattering of exposed bedrock increased, forming many of the screes and boulder cones that are seen in the mountains today.

As the glaciers and ice sheets began to melt, mounds and ridges of sand and gravel, containing durable rounded pebbles and cobbles, derived from the glacial tills and the local bedrock, were deposited by streams of glacial meltwater close to the front of the decaying ice. These waterlain sediments, which are shown as glacial sand and gravel or glaciofluvial ice-contact deposits on geological maps, are widespread in the major valleys of the region, such as Strathspey and Strathnairn. They also occur along the southern margin of the Moray Firth and on the coastal lowlands around the Beaulay, Cromarty and Dornoch firths. These moundy glaciofluvial deposits are generally thickest in the south-eastern part of the region. They commonly rest on till or bedrock and are generally more permeable than either. The glaciofluvial sands and gravels that form flat-topped terraces in most valleys were deposited by glacial meltwater rivers further from the ice front. These glaciofluvial sheet deposits are normally of more uniform composition and thickness than the ice-contact sands and gravels. Both types of deposit, which may be tens of metres in thickness, are attractive as sources of building aggregate. Consequently, many active and disused sand and gravel workings are sited on them.

During the last 10 000 years the Highlands have experienced a milder temperate climate. Rivers have deposited gravel, sand, silt and clay to form floodplains and low-lying river terraces on the floors of the present valleys. Deltas of silt and sand have also developed where the mouths of rivers and burns enter lochs or the sea. These 'alluvial sequences' generally lie close to (or below) the local water table, which may vary in height seasonally and most form ground that is subject to periodic flooding.

Spreads of peat mantle the tops and gentler slopes of many of the hill areas, such as the Monadhliath Mountains, and cover large plateaux, such as the Gaick Forest, to depths of several metres. Extensive peat bogs, many metres deep in places, also characterise the flow country of Caithness and Sutherland. Much of the hill peat developed on top of thin till or bedrock, under the wetter climatic conditions that followed the end of the Loch Lomond glaciation. Today much of it is drying out and being eroded away. Permanently waterlogged peat, overlying silty sands and clays, infills hollows and fringes lake basins excavated in the bedrock by the earlier glaciers.

In many places around the coast, machair and dunes of highly permeable blown sand flank the modern beaches. Raised beaches of gravel, sand and silty sand also occur, up to 30 metres above present sea level, particularly on the eastern side of the region. These ancient beaches have been stranded by falling relative sea levels, caused by the slow rebound of the Scottish landmass, which has taken place since the disappearance of the 'Main Late Devensian' ice sheet.

Groundwater is found in many types of rock as well as in glacial and alluvial deposits in the Highlands. The relatively thin mantle of Quaternary sediments can be significant reservoirs of groundwater. Wherever a hole is dug in the ground, whether clayey or sandy, the bottom tends to fill with water, not just from the rain often falling directly into it, but also from seepages in the sides of the pit. This is usually due to small amounts of groundwater being released from small porous layers in the rocks and sediments, and it is this process that formed the water supply from shallow wells for many thousands of farms and cottages across Scotland. A few metres beneath our feet, hidden channels of sand or gravel, in what is mainly a deposit of till, can be full of water and be a valuable source of relatively large volumes of groundwater.

The most permeable and richest sources of groundwater in the Quaternary strata are alluvial sands and gravels, such as those found in the valleys of the rivers Spey and Lochy. The water table in these deposits is usually only a metre or two below ground level, so that wells and boreholes need only penetrate a few metres down in order to tap the source. The fairly uniform nature of these deposits means that water can flow freely through them towards a well and means that yields are often very high, perhaps as much as half a million gallons per day from a single borehole. However, the position of these sands and gravels close to the ground surface, combined with a shallow water table, also makes the water within them particularly susceptible to contamination from industrial and domestic waste products, as well as from agricultural nitrogen fertilisers.

Groundwater can also be found at depths of hundreds of metres. This water originally fell as rain and has seeped slowly through porous rocks as well as along fractures and joints. Whereas shallow groundwater may only be a few years in age, much of it found at depth can be hundreds if not thousands of years old. Depending on the type of rock, the amount of water found at depth can vary considerably. Some boreholes are capable of pumping hundreds of thousands of gallons every day, whereas others can only manage a few hundred.

Sandstones, found in the east of the region, around the Moray Firth and in Caithness, are the most productive rock types, because the porous nature of the rock allows up to 15% of its volume to comprise water. Well-developed fissures in the rock act as 'motorways', collecting water held in tiny pore spaces and allowing relatively rapid movement of groundwater towards a well or borehole. The success of a borehole for water production in sandstone and most other rock types depends to a large extent on the number of interconnected fissures intercepted during the drilling process. A potential drawback with highly permeable rocks such as sandstones is that liquid pollutants disposed of at the surface can quickly find their way through overlying sands and gravels and into the deeper aquifer system. Pathways along fissures means that there is relatively little opportunity for pollutants to attenuate, compared to silty coarse sands where fluids can only progress via minute, tortuous paths between sand grains. Many of the sandstone aquifers near Inverness are overlain by sands and gravels so that there may be potential for contamination of these aquifers.

Within the mountainous areas, hard rocks such as granite, schist, gneiss, quartzite and lava underlie much of the country. These rocks are crystalline in character and have almost no capacity to store groundwater within pore spaces. Consequently, the only storage available is within the fractures themselves. Often, these rocks are 'massive' in character and have little in the way of an interconnected fissure system. In this situation, very little groundwater is stored and borehole yields are usually very low, of the order of a hundred to a few thousand gallons per day. However, if a water supply for a house is the only requirement, then a borehole drilled to a depth of between 30 m and 50 m may be perfectly adequate. There are hundreds of such boreholes in existence in the Highlands providing individual domestic water supplies. They have the advantage of providing clear water instead of the peaty brown variety obtained from many upland streams.

In spite of their poorly permeable nature, there is often great potential for surface wastes to quickly enter hard rock aquifer systems. Fractures in crystalline rocks can transport fluids quickly to the water table and, as there is almost no potential for intergranular flow or adsorption onto granular surfaces, the potential impact of pollutants on groundwater is high. This is particularly so because much of the hard rock in the Highlands is overlain by only thin till with the absence of a 'buffer zone' of sand or gravel.



**HIGHLAND COUNCIL STRUCTURAL PLAN –**

**POLICY B1 – Industrial and business Sites**

Local Plans will safeguard and support a portfolio of industrial and business sites of the following types and locations (as shown in Figure 11):

- Large petrochemical site protected in the national interest (see Policy B5) –  
Nigg;
- Large single user industrial site –  
Delny;
- Strategic industrial and business development sites –  
Achnagonalin Industrial Estate, Grantown-on-Spey  
Cairngorm Technology Park, Aviemore  
Thurso Business Park  
Murkle Bay, Thurso  
Inverness Retail and Business Park  
Kinlochleven Business Park  
Annat Point Industrial Estate, Fort William  
Blar Mhor Industrial Estate, Fort William  
Glen Nevis Business Park, Fort William  
Balmakeith Industrial Estate, Nairn  
Alness Point Business Park  
Dingwall Business Park  
Highland Deep Haven, Evanton  
Cromarty Firth Industrial Park, Invergordon  
Inverbreakie Industrial Estate, Invergordon  
Lochalsh Business Park, Auchtertyre  
Broadford Industrial Estate  
Dornoch Business Park; and

Other sites for small and medium sized enterprises (see Policy B3).

**POLICY - B2 Industrial and business sites**

Local Plans will identify new high quality business and industrial sites in the following locations:

- Wick;
- Portree;
- Golspie; and
- Inverness (A96 Corridor).




**POLICY – B3 Local industrial land supply**

Provision will be made in Local Plan for a supply of land for general industry and business development so that there will be availability as follows:

- |                         |      |
|-------------------------|------|
| • Badenoch & Strathspey | 5ha  |
| • Caithness             | 5ha  |
| • Inverness             | 20ha |
| • Lochaber              | 5 ha |
| • Nairn                 | 2ha  |
| • Ross & Cromarty       | 20ha |
| • Skye & Lochalsh       | 3ha  |
| • Sutherland            | 2ha  |

Appendix V. Provisional timetable for priorities and objectives over a 5-year period

	2001												2002												2003												2004												2005																																																																																					
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D																																																																										
Strategy Development & Publication	[shaded]												[shaded]												[shaded]												[shaded]												[shaded]																																																																																					
Strategy Review	[shaded]												[shaded]												[shaded]												[shaded]												[shaded]																																																																																					
<b>OBJECTIVES</b>																																																																																																																																						
Identification of potential sources, receptors & possible pathways	[shaded]												[shaded]												[shaded]												[shaded]												[shaded]																																																																																					
Collation of Information	[shaded]												[shaded]												[shaded]												[shaded]												[shaded]																																																																																					
GIS Development & Management	[shaded]												[shaded]												[shaded]												[shaded]												[shaded]																																																																																					
Targeting Priority Areas	[shaded]												[shaded]												[shaded]												[shaded]												[shaded]																																																																																					
Identification of contaminated land	[shaded]												[shaded]												[shaded]												[shaded]												[shaded]																																																																																					
Provision & maintenance of register	[shaded]												[shaded]												[shaded]												[shaded]												[shaded]																																																																																					
<b>PRIORITY AREAS FOR INSPECTION</b>																																																																																																																																						
Areas with historic potentially contaminative land use	[shaded]												[shaded]												[shaded]												[shaded]												[shaded]																																																																																					
Areas with high population density	[shaded]												[shaded]												[shaded]												[shaded]												[shaded]																																																																																					
Areas with environmental receptors	[shaded]												[shaded]												[shaded]												[shaded]												[shaded]																																																																																					
Areas with important food production	[shaded]												[shaded]												[shaded]												[shaded]												[shaded]																																																																																					
Areas containing valuable/vulnerable waters	[shaded]												[shaded]												[shaded]												[shaded]												[shaded]																																																																																					
Areas with important established pathways	[shaded]												[shaded]												[shaded]												[shaded]												[shaded]																																																																																					
Area highlighted outwith the strategy	[shaded]												[shaded]												[shaded]												[shaded]												[shaded]																																																																																					
Areas of environmental & landscape value	[shaded]												[shaded]												[shaded]												[shaded]												[shaded]																																																																																					
Areas without supported redevelopment status	[shaded]												[shaded]												[shaded]												[shaded]												[shaded]																																																																																					

**KEY**  will take place during this period  are most likely to take place during this period  may take place during this period

## Glossary and acronyms

BGS: British Geological Survey, Murchison House, West Mains Road, Edinburgh EH9 2LA.

Controlled water: territorial, coastal, inland fresh and ground waters, defined in section 2.6.1.

COSLA: Convention of Scottish Local Authorities, Rosebery House, 9 Haymarket Terrace Edinburgh.

Ecosystem: a unit consisting of a community of organisms and their environment.

EPA: Environmental Protection Act 1990.

FSA: Food Standards Agency, 6<sup>th</sup> Floor, St Magnus House, 25 Guild Street, Aberdeen AB11 6NJ.

GIS: Geographical Information System.

Glacio-fluvial: pertaining to glacial rivers.

HSE: Health and Safety Executive, Belford House, 59 Belford Road, Edinburgh EH4 3UE.

MLURI: MacAuley Land Use Research Institute, Craigiebuckler Aberdeen AB15 8QH.

NOSWA: North of Scotland Water Authority, Torridon House Beechwood Business Park,  
Inverness IV1 3BW

NRA: National Rivers Authority

Pathway: a route, or means by which a receptor is, or could be exposed to a contaminant through.

Pollutant: an element, compound or material offensive or harmful to human, animal, or plant life.

Pollutant linkage: the relationship between a contaminant and receptor by means of a pathway.

PPSO.CL: Principal Protective Services Officer (Contaminated Land), Protective Services, Glenurquhart Road, Inverness, IV3 5NX.

Quaternary: the quaternary is the geological period of glacial history encompassing the last 2 million years. Quaternary geology tends to consist of a superficial layer or mantle of unconsolidated sediment or drift.

Ramsar: an international wetland site designation for protection of birds.

Receptor: a receptor is either:

- (a) a living organism, a group of living organisms, an ecological system or a piece of property which (i) is in a category listed in Table A (see Appendix I) as a type of receptor, and (ii) is being or could be harmed by a contaminant; or
- (b) controlled waters which are being, or could be, polluted by a contaminant

RIP(S)A: Regulation of Investigatory Powers (Scotland) Act 2000

Risk: exposure to a hazard, and the degree of probability of loss, injury or danger through such exposure.

SAC: Special Area of Conservation, a European site designation.

SEERAD: Scottish Executive Environment and Rural Affairs Department, Victoria Quay,  
Edinburgh EH6 6QQ

SEPA: Scottish Environment Protection Agency, Corporate Office, Erskine Court, The Castle Business Park, Stirling FK 9 4TR

SERAD: Scottish Executive Rural Affairs Department, now superseded by SEERAD

Source: the origin or supply of contamination or contaminants.

SNH: Scottish Natural Heritage, Fraser Darling House, 9 Culduthel Road, Inverness IV2 4AG

SPCCC: Scottish Pollution Control Co-ordinating Committee.

SSSI: Site of Special Scientific Interest, a National conservation designation.

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

Sustainable development: is the balance and interdependence of development incorporating key principles in supporting the viability of communities, developing a prosperous and vibrant economy, and safeguarding and enhancing the natural and built environment.

## References

- Alston, D. Ross and Cromarty: A Historical Guide. Birlinn Ltd. Edinburgh 1999.
- Building Standards (Scotland) Regulations 1990
- Close-Brooks, J. The Highlands. HMSO Edinburgh 1995.
- Contaminated Land (Scotland) Regulations 2000
- Environment Act 1995
- Environmental Protection Act 1990
- Fletcher T.P, Auton C.A, Highton A.J, Robertson S. and Rollin K.E. British Geological Survey. Geology of Fortrose and eastern Inverness district. Memoir for 1:50 000 Geological Sheet 84W (Scotland) HMSO London 1996.
- Johnstone G.S, and Mykura W. British Regional Geology. The North Highlands of Scotland. HMSO London 1989.
- Planning Advice Note PAN 33 Revised 2000: Development of Contaminated Land. Scottish Executive Development Department.
- Private Water Supplies (Scotland) Regulations 1992.2000 Return. The Highland Council, Protective Services.
- Roberts J.R. The Highland Geology Trail. Luath Press Ltd Edinburgh 2000.
- Scottish Environment Protection Agency. Framework for Local Authority-SEPA liaison under Part IIA of the Environmental Protection Act 1990. 2000, SEPA Stirling
- Scottish Environment Protection Agency. Policy No 19 Groundwater Protection Policy for Scotland. 1997, SEPA Stirling
- Scottish Executive Rural Affairs Department Circular 1/2000. Environmental Protection Act 1990: PartIIA Contaminated Land.
- Syms P.M. Desk Reference Guide to potentially Contaminative Land Uses 1999. ISVA, 3 Cadogan Gate, London.
- Taylor A and Nortcliff S. Soils: Scotland's Living Landscapes. Scottish Natural Heritage, Publications Section, Perth 1996
- The Highland Council, Facts and Figures 2001. Available from The Highland Council, Glenurquhart Road Inverness, IV3 5NX.
- The Highland Council, Highland Trends 1999. Available from The Highland Council, Glenurquhart Road Inverness, IV3 5NX.
- The Highland Council, Statement of Strategic Goals and Values 1996. Available from The Highland Council, Glenurquhart Road Inverness, IV3 5NX.
- The Highland Council, Structure Plan 2000. Available from The Highland Council, Glenurquhart Road Inverness, IV3 5NX.

## Bibliography

Department of Environment CLR Report No 5. Information Systems for Land Contamination. DoE 1994.

Department of Environment CLR Report No 6. Prioritisation and Categorisation Procedure for Sites which may be Contaminated. DoE 1995.

Downing R.A. Groundwater our hidden asset. British Geological Survey Nottingham 1998.

Edmonds E. The Geological Map: An Anatomy of the Landscape. HMSO 1983.

Groundwater Vulnerability Map of Scotland. British Geological Survey, Murchison House, West Mains Road, Edinburgh EH9 2LA.

Hydrogeological Map of Scotland. British Geological Survey, Murchison House, West Mains Road, Edinburgh EH9 2LA.

Marsland P.A and Carey M.A. Methodology for the Derivation of Remedial Targets for Soil and Groundwater to Protect Water Resources. Environment Agency R & D Publication 20. 1999.

Robins N.S. Hydrogeology of Scotland. British Geological Survey HMSO London 1990.

Ross, D. Scotland: History of a Nation. Lomond Books Ltd. 2000.

Rudland, D.J, Lancefield, R.M and Mayell, P.N. Contaminated land risk assessment. A guide to good practice. Construction Industry Research Information Association C552. CIRIA 2001.

Scotland & Northern Ireland Forum For Environmental Research . Framework for Deriving Numeric Targets to Minimise the Adverse Human Health Effects of Long-term Exposure to Contaminants in Soil. SNIFFER SR99(02) April 2000

Scottish Enterprise. How to Approach Contaminated Land. Scottish Enterprise 1998

Scottish Enterprise. How to Investigate Contaminated Land. Scottish Enterprise 1998.

Scottish Executive Rural Affairs Department. Contaminated Land Strategies: Advice for Local Authorities. August 2000.

Syms P.M. Desk Reference Guide to potentially Contaminative Land Uses 1999. ISVA, 3 Cadogan Gate, London.

The Highland Wellbeing Alliance, Community Plan for Highland. Available from The Highland Council (Policy Unit), Glenurquhart Road Inverness, IV3 5NX.