REFERENCE

THE REGULATION OF CONTAMINATED LAND IN ENGLAND: A SOLUTION OR PROBLEM?

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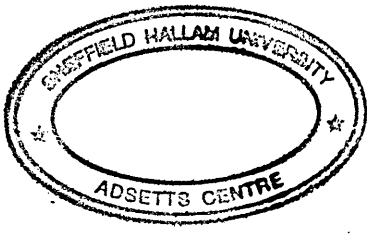
A thesis submitted in partial fulfillment of the requirements of Sheffield Hallam University for the degree of Doctor of Philosophy



March 2005

Collaborating Organisation:
Barnsley Metropolitan Borough Council

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ABSTRACT

KEYWORDS

CONTAMINATED LAND	REGULATION	RISK ASSESSMENT
REDEVELOPMENT	LEGISLATION	LOCAL AUTHORITY

This thesis is concerned with the regulation of contaminated land and the way in which local authorities in England have prepared for and are now implementing Part IIA of the Environmental Protection Act 1990. Part IIA provides a risk-based framework for the identification and remediation of contaminated land. The legislation requires local authorities to take a strategic approach to the identification of contaminated land. The strategic approach adopted by individual local authorities will differ according to resources, technical expertise, size, population, political control and ability to attract inward investment through regeneration.

The thesis provides a review of current literature relating to contaminated land policy and risk assessment. The research critically assesses the use of a risk assessment methodology for the identification of contaminated land and evaluates the strategic decision making processes of local authorities charged with a legal duty to identify contaminated land in their area. The thesis also considers the wider implications of Part IIA for the redevelopment of other land, which falls outside the statutory definition of 'contaminated land' but is affected by the presence of contamination.

Over 100 local authority officers responsible for dealing with contaminated land participated during various phases of this research. The research consisted of a focus group, questionnaire survey, and an interview phase in order to identify local authority progress before and after implementation. The research presents the findings of a collaborative study with Barnsley MBC and a comparative study of the regulation and redevelopment of contaminated land in Cleveland Ohio, USA. Two case studies are also presented evaluating the risk assessment process applied in a Part IIA context.

The research findings identify a number of potential problems for local authorities in implementing Part IIA effectively. Local authorities appear to be struggling to meet self imposed targets set as part of their strategies due to budget restraints, lack of political pressure, potential liability issues, staff changes and insufficient technical guidance. Potential solutions are suggested as part of the conclusions and provide a contribution to knowledge by informing policy makers about the effectiveness of the contaminated land regime. The contaminated land regime is still relatively new and this thesis describes a number of opportunities for further research.

I declare that no portion of the work referred to in this thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institution of learning.

Peter Edward Knight
18th March 2005

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ACKNOWLEDGMENTS

Firstly I would like to acknowledge Barnsley Metropolitan Borough Councils' Landfill Gas & Contaminated Land Working Party for its assistance and financial support during the early phases of this project. I am also extremely grateful to the RICS Education Trust for providing financial support to enable the author to study an alternative contaminated land regime in Cleveland Ohio. I thank all those who gave up their valuable time to talk to me whilst I was in Cleveland especially Professor Robert Simons at Cleveland State University for his advice and support.

I would like to thank my Director of Studies Professor Paul Syms for his continuing support, encouragement and helpful advice throughout the research project. I am grateful to Dr Ralph Horne for stepping in and providing advice towards the end of the writing up phase following the death of my previous supervisor Professor Cedric Pugh.

I would like to acknowledge the useful advice and up to date information provided by Philip Whitaker the Capital Projects Manager at the Environment Agency.

Over 100 individuals have given their time to complete questionnaires, take part in face to face interviews and assistance in completing case studies. Their contribution is gratefully acknowledged.

Finally I would like to acknowledge the tremendous support and encouragement I have received from my family throughout this research project. I would like to thank my parents Stephen and Joyce for providing much needed quiet accommodation during the final writing-up phase and help in proof reading the final document. I would especially like to thank my wife Marie for her continued patience and for looking after our four children during the completion of this thesis.

LIST OF ABBREVIATIONS

ALARP	As low as reasonably practicable
BGS	British Geological Survey
BRE	Building Research Establishment
BSI	British Standards Institute
BURA	British Urban Regeneration Association
CARACAS	Concerted Action for Contaminated Sites in the European Union
CCMS	Committee for Challenges to Modern Society
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CIRIA	Construction Industry Research and Information Association
CIEH	Chartered Institute for Environment and Health
CLARINET	Contaminated Land Rehabilitation Network For Environmental Technologies
CLEA	Contaminated Land Exposure Assessment
CLO	Contaminated Land Officer
CLR	Contaminated Land Report
CNTS	Covenant not to sue
COPA	Control of Pollution Act (1974)
DEFRA	Department for Environment, Food and Rural Affairs
DETR	Department of the Environment, Transport, and the Regions
DH	Department of Health
DoE	Department of the Environment
DQRA	Detailed Quantitative Risk Assessment
EA	Environment Agency
EHO	Environmental Health Officer
EPA	Environmental Protection Act (1990)
FoE	Friends of the Earth
FSA	Food Standards Agency
GQRA	Generic Quantitative Risk Assessment
GIS	Geographic Information System
HRS	Hazard ranking system
ICE	Institution of Civil Engineers
ICRCL	Interdepartmental Committee on the Reclamation of Contaminated Land
ID	Index Dose
IoP	Institute of Petroleum
JRF	Joseph Rowntree Foundation
LAA	Local Authority Association
LCR	Land Condition Record
LGA	Local Government Association
LQS	Land Quality Statement
LUST	Leaking underground storage tank
MDI	Mean daily intake
MOU	Memorandum of understanding
NFA	No further action (letter)
NFRAP	No further remedial action planned
NICOLE	Network for Industrially Contaminated Land in Europe

NHBC	National House-Building Council
NPL	National Priority List
ODPM	Office of the Deputy Primeminister
OEPA	Ohio Environmental Protection Agency
PAH	Polyaromatic Hydrocarbon
PBET	Physiologically Based Extraction Test
POST	Parliamentary Office of Science and Technology
RBCA	Risk-based corrective action RR respiration rate
RBSL	Risk Based Screening Levels
RCEP	Royal Commission on Environmental Pollution
RCRA	Resource Conservation and Recovery Act
RDA	Regional Development Agency
RICS	Royal Institution of Chartered Surveyors
RTPI	Royal Town Planning Institute
SCA	Supplementary Credit Approval
SEPA	Scottish Environmental Protection Agency
SNIFFER	Scotland and Northern Ireland Forum for Environmental Research
SRA	Social Research Association
SRB	Single Regeneration Budget
SSA	Standard Spending Assessment
TCPA	Town and Country Planning Association
TDI	Tolerable daily intake
TDSI	Tolerable daily soil intake
US EPA	United States Environmental Protection Agency
UST	Underground storage tank
VAP	Voluntary Action Program
VCP	Voluntary cleanup program
WDA	Welsh Development Agency
YAHPAC	Yorkshire and Humberside Pollution and Advisory Council

CHAPTER 1

THE REGULATION OF CONTAMINATED LAND

> *"After section 78 of the [1990 c. 43.] Environmental Protection Act 1990 there shall be inserted – Part IIA Contaminated Land".*
> S.57 Environment Act 1995

1.1 INTRODUCTION

This thesis is concerned with the regulation of contaminated land and the way in which local authorities in England have prepared for and are now implementing Part IIA of the Environmental Protection Act 1990. The research critically assesses the use of a risk assessment methodology for the identification of contaminated land.

The research evaluates the strategic decision making processes of local authorities charged with a legal duty to identify contaminated land in their area. The thesis also considers the wider implications of Part IIA for the redevelopment of other land, which falls outside the statutory definition of 'contaminated land' but is affected by the presence of contamination.

1.2 THE OVERALL AIM AND OBJECTIVES

The overall aim of the research is to critically assess the current regulatory framework for the identification and remediation of contaminated land and establish whether local authorities can effectively identify contaminated land given the current level of resources and technical guidance.

The principal research objectives are as follows:

- *To review and critically assess current literature relating to contaminated land policy and risk assessment. The review also includes an evaluation relating to the wider implications of implementation of Part IIA on the regulation of land affected by contamination under the Planning Control regime.*

- *To develop and evaluate (in conjunction with Barnsley MBC) a sample methodology for prioritising land for further investigation.*
- *To evaluate alternative contaminated land policy approaches in other countries and identify a case study example which could be adopted in England.*
- *To assess local authority preparations for the implementation of Part IIA and evaluate current progress in relation to the regulation of contaminated land.*
- *To compare different local authority strategic approaches to the identification and assessment of contaminated land including the identification of roles and responsibilities within individual local authorities*
- *To identify the cost of implementing Part IIA for individual local authorities and present possible solutions where shortfalls are identified.*
- *To assemble and critically appraise examples of local authority regulatory action under the provisions of Part IIA*
- *To examine possible barriers to the effective implementation of Part IIA and where possible present possible solutions.*

1.3 BACKGROUND

A new policy framework for the identification and remediation of contaminated land in the UK was introduced following Royal Assent of the Environment Act 1995. S.57 of the Environment Act 1995 retrospectively inserted Part IIA into the Environmental Protection Act 1990.

Part IIA of the Environmental Protection Act 1990 was brought into effect on 1st April 2000 following the introduction of supporting Statutory Guidance (DETR Circular 02,2000) issued by the Secretary of State for the Department of Transport Environment and the Regions (now DEFRA). The Secretary of State also issued 'Contaminated Land (England) Regulations 2000 (S.I 2000/277) which were also required by the provisions of Part IIA.

The collective term for Part IIA, the Statutory Guidance (DETR Circular 02/2000) and the Contaminated Land (England) Regulations 2000 is the *Contaminated Land Regime* (DETR, 2000a:2).

The above Statutory Guidance only applies to England. This is due to the formation of a devolved Government in Scotland, and the formation of a Welsh Assembly whilst the supporting Statutory Guidance was being developed. Similar, but separate Statutory Guidance was issued in Scotland and Wales and in Northern Ireland at a later date. This thesis is concerned only with the Part IIA regime as it applies to England.

Part IIA is intended to allow regulators to identify land in its current use that is significantly contaminated and may have implications for human health and/or the wider environment. It is government policy (DoE 1994c, DETR, 2000, DTLR 2002) that other land, which is affected by the presence of contamination, but is suitable for its current use, should be dealt with through the Planning and Development Control process.

Under the provisions of Part IIA local authorities are required to produce strategies and systematically inspect their areas for the purpose of identifying land which is contaminated (EPA, 1990 S.78B (1)). The duty for local authorities to inspect their areas is a proactive requirement. Research undertaken by the author as part of an undergraduate dissertation in 1996 identified that lack of funds, human resources and technical expertise were all potential barriers to the effective implementation of Part IIA. The research supported the view suggested by Graham (1995) that "it would not be surprising if local authorities merely performed reactively upon receipt of complaints only" (Graham, 1995:22). One interviewee at the time stated that it was "not planning to actually go onto sites and physically identify sites as this would not be possible financially" (Knight, 1996:48).

The role of the local authority is extremely important as ineffective implementation of Part IIA has the potential to lead to continued long-term health risks from a number of sites as well as potentially reducing confidence among developers and investors looking for new development opportunities on previously developed land.

1.4 RELEVANT LITERATURE

At the present time there is not a significant amount of academic literature relating to the effective implementation of Part IIA by local authorities. Environmental and property press have provided reasonably frequent updates regarding the number of sites that have been identified as contaminated land, but offer little in terms of further evaluation. The contaminated land regime has been in place for almost four years and a significant proportion of the published texts and journals available regarding contaminated land policy tend to be descriptive without offering further evaluation of how the policy is working in practice.

The potential for land to be contaminated affects a large group of stakeholders, regulators, developers, engineers, financiers, insurers, the general public. A significant amount of technical guidance has been published by national public agencies and organisations and by representative professional institutions regarding best practice in terms of the identification, assessment and remediation of contaminated land.

The literature presented in this thesis concentrates primarily on policy and technical guidance that was available to local authorities up to November 2003.

1.5 THE LEGACY OF CONTAMINATION

Urban characteristics in the United Kingdom have changed dramatically over the last two centuries. Industrial and manufacturing sectors that grew in the central areas of most towns and cities in the late 18th and early 19th century contracted considerably during the 1970s and 1980s. This was largely due to

competition from overseas, changes in production methods and a political shift towards the service sector.

This decline has left large areas of many urban areas affected by the presence of contamination that may pose a risk to human health and the wider environment. However, not all land potentially affected by the presence of contamination is in urban areas, "in many parts of the country, past industrial or commercial uses were located in rural areas (e.g. metal and coal mining)" (POST 1998:2). Therefore the introduction of Part IIA is likely to have implications for all local authorities in England.

1.6 CONTAMINATED LAND POLICY IN THE UK

Contaminated land policy in the United Kingdom developed over 30 years on the basis that land should be *suitable for use*. The *suitable for use* approach was first adopted in the late 1970s where land was to be redeveloped for the following end uses: commercial, industrial and public open space, with some re-use of land for residential purposes. Policy issues in relation to contaminated land have a major impact on the economic factors surrounding the re-use of such land as well as the potential health issues and perception about living and working on areas of previously used land.

UK contaminated land policy was initially formulated by members of the *Inter Departmental Committee on the Redevelopment of Contaminated Land* (ICRCL). The policy adopted by the ICRCL was a risk-based approach to the redevelopment of land on previously used land. The ICRCL published documentation providing developers and their advisors with a list of commonly found contaminants on previously used sites. It isn't clear from a review of literature how these acceptable concentrations were derived and in many circumstances required 'professional judgment' to determine whether a site could be developed safely. The difficulty with this approach is that in the past "local authorities have proved to be inconsistent in the way they assess the risks on previously used land with some requiring excessive remedial works whilst others have not required any" (Syms, 1997a:65). The new contaminated

land regime is supposed to provide a more robust and transparent approach to the assessment and remediation and regulation of contaminated land.

The Government stated in the consultation paper *Paying for our Past* (DoE, 1994) that, wherever possible, land contamination should be controlled through the planning and development control process. Planning Policy Guidance note 23 *Waste and Pollution* (DoE, 1995) requires local authorities to take account of the potential for land contamination when assessing developments on sites suspected or known to have contamination present.

The Government White paper *Household Growth: Where Shall We Live?* (DETR,1998) recommended that an aspirational target of 60% of new homes should be built on brownfield land (DETR,1998:1). This figure of 60% has since been adopted as an achievable target for all local authority areas in England (DETR, 1998, Urban Task Force 1999). In addition a sequential test has been added to Planning Policy Guidance Note 3 *Housing* that requires planning authorities to take into account potential developable brownfield sites ahead of greenfield sites. Many brownfield sites have the potential to have contamination present and will require an assessment of current and future risks as part of the development control process. The cost of reducing or removing any identified risks may be a barrier to future development of some sites, but at the present time in many urban areas the target of 60% of new homes is being achieved.

The re-use of land for development is not a new phenomenon. In 1986 approximately 60% of development was on land that had had some previous use (ICRCL, 59/83,1987:2). Much of this re-used land was developed for commercial and industrial end–uses in areas where the Government had set up Development Corporations and enterprise zones. Schemes such as the Meadowhall Centre in Sheffield and the Liverpool Docklands area provides good examples of such regeneration schemes.

Where the potential risk from contamination is *significant* and there isn't the potential for that land to be remediated as part of the redevelopment process, then local authorities may take regulatory action using the provisions of Part IIA of the Environmental Protection Act 1990.

Chapter Two describes the development of UK policy in relation to contaminated land. It provides a critical appraisal of the current definition of contaminated land and considers alternative definitions. Chapter Two examines possibilities for the redevelopment of potentially contaminated land and policy relating to the regulation of land contamination by local authorities as part of the development control process. By reference to literature, Chapter Two examines other factors relating to land contamination that can have a significant influence on the redevelopment of such land e.g. risk perception, liability concerns, remediation costs and financial incentives. Alternative policy approaches have been adopted in other countries. Chapter Two provides a brief summary and assessment of these policies.

1.7 IDENTIFICATION AND MANAGEMENT OF CONTAMINATED LAND

The introduction of Part IIA means that the UK has endorsed a risk-based framework within which contaminated land can be identified, assessed and managed (Young, Pollard and Crowcroft, 1997:6). However, assessing risks in relation to contaminated land can be extremely time consuming and expensive. The risk-based framework provided by Part IIA is intended to assist local authorities adopt a more consistent approach to assessing the risks from previously used sites in development situations (Baker, 1997:1).

Local authorities are required to inspect their areas for the purpose of identifying contaminated land (S.78(b) EPA 1990). Part IIA places a requirement on local authorities to assess the potential for contaminated land to exist and prioritise such land for further inspection. The Part IIA regime requires land to be assessed in relation to its *current use* only. Other land which may be contaminated, but does not meet the statutory definition, will only be remediated as and when it is brought through the development control process or the landowner wishes to deal with the contamination.

The introduction of Part IIA was intended to clarify the rules regarding the potential for land to be *contaminated land*. Following the implementation of Part IIA the Contaminated Land Exposure Assessment model (CLEA) was introduced along with supporting guidance to assist regulators, investors,

landowners and developers. The CLEA model forms part of a tiered process with regard to the identification and assessment of land contamination.

The first stage of the tiered process requires local authorities to establish a *pollutant linkage* (e.g. there is a potential source of contamination, a receptor that could be harmed by ingesting or inhaling vapours from the soil and a pathway through which that receptor could be harmed). The initial inspection of a local authority area is likely to identify a significant number of sites where there is a possible pollutant linkage that will have to be prioritised according to risk and available resources. The government has not introduced any formal method or model for the identification and further prioritisation of contaminated land. Local authorities are therefore required to develop or procure a system of identification as part of their Inspection Strategy.

The ability of local authorities to undertake the first tier of the process across their entire area will depend on a number of factors, such as available resources, staffing levels, past historical land use, local political issues, etc.

The second tier of the process requires an assessment regarding the significance of the contaminant(s). This involves obtaining representative soil samples and having them analysed at a suitably accredited laboratory. The results of the laboratory analysis can be assessed by reference to Soil Guideline Values (SGVs) where they are available. At the present time SGVs are only available for a limited number of contaminants. The SGVs are only applicable to three land uses (Residential, Allotments and Commercial/industrial).

Where an SGV has not yet been published or the site being assessed does not meet the relevant land use criteria then local authorities will have to identify or develop other assessment criteria. Developing other assessment criteria for a contaminant may have implications for local authorities. For example, assessment criteria was developed in 'The Manor' case study described in Chapter Eight prior to the introduction of SGVs for Lead and Arsenic. The assessment criteria used at the time was not as conservative as the published

SGVs and it is likely that parts of the estate may need to be re-evaluated in the future as part of the local authority's contaminated land strategy.

Where the assessment criteria is exceeded then there are a number of possible alternatives, remove the contamination, remove the receptor, break the pathway or in some circumstances it may be acceptable to monitor the contamination.

When considering whether a site should be determined as contaminated land local authorities are required to follow procedures laid down in the Statutory Guidance. The guidance is intended to provide local authorities with sufficient detail to enable any risks to be removed or managed and establish procedures for establishing liability for the cost of remediation. In many cases local authorities will want to be extremely confident that land is unquestionably contaminated land and that the parties responsible for remediation costs are unlikely to mount a legal challenge. The possibility of a legal challenge has potentially significant financial implications for all parties involved.

Chapter Three draws together a review of current literature relating to the risk assessment of land affected by contamination. The Chapter discusses alternative approaches to the prioritisation of land for further investigation under Part IIA and the new *Contaminated Land Exposure Assessment (CLEA) model* adopted by the UK in 2002. Ineffective or inappropriate use of prioritisation methods for the identification of contaminated land is likely to reduce developer and investor confidence in the redevelopment of brownfield land. The Chapter also evaluates current technical guidance available to risk assessors and provides a critical assessment of the procedural requirements of Part IIA where contaminated land is identified.

1.8 LOCAL AUTHORITY STRATEGIES

It is the author's opinion that local authority progress with the strategy is the key factor with respect to the effective implementation of Part IIA. The effectiveness of Part IIA may be evaluated by examining whether local authorities are able to implement their contaminated land inspection strategies. Failure to implement the strategy has implications with respect to contaminated land but also has

wider impacts for the reuse of land affected by contamination. Uncertainty regarding the status of land and the possibility that a site may be determined as contaminated land may in certain circumstances may lead to 'blight'.

Local authorities were provided with guidance about producing a contaminated land strategy in May 2001 (DETR, 2001). The guidance suggested a format based on the Statutory Guidance (DETR, 2000a) which local authorities could follow in order to produce a strategy. This guidance was provided to local authorities just prior to the statutory deadline for local authority publication of their strategy. It is therefore not surprising that many local authorities failed to meet the 1st July 2001 deadline.

The strategy adopted by local authorities will depend upon a number of factors such as industrial heritage, land use change, available resources, technical expertise, development activity and political priority given to the strategy. Subsequent changes to available resources, available staff and political priority will all have an influence on an individual local authorities ability to implement their strategy.

Chapter Four considers the requirement for each local authority to produce a strategy and assesses alternative methods for identifying contaminated land on an area wide basis. The chapter considers how land will be prioritised for further investigation and targets that have been set by different local authorities. The chapter also provides a brief consideration of how local authorities may communicate potential risk from contaminated land as part of their strategy.

1.9 RESEARCH METHODS

Chapter Five presents an explanation of the research methodology adopted in order to achieve the stated aim and objectives of this research programme. This research project is concerned with the implementation of a new policy, which has potentially significant impacts for local authorities in England. The research examines the decision making process of local authorities in establishing priorities for the identification of contaminated land and provides an assessment

of the effectiveness of a relatively new regime for dealing with contaminated land.

This research utilises both positivistic and humanistic research methods in order to achieve the aim and objectives. The research methods adopted at the various stages of research process were intended to provide a degree of triangulation when interpreting the findings. It is argued that the use of different research methods has provided greater meaning and validity to research findings. The research consisted of a focus group interview, a questionnaire survey, face-to-face interviews, a review of documentary evidence and case studies.

Difficulties were encountered during the research process due to delays by the government issuing the Statutory Guidance (DETR, 02/2000). This led to a longitudinal assessment of progress to be undertaken as part of this research. In addition, the programme of research was originally undertaken on a full-time basis but changed to part-time following the author's appointment as Contaminated Land Officer at Sheffield City Council in September 2000.

1.10 RESEARCH AND FINDINGS

Chapter Six presents the results of a pilot study undertaken on behalf of Barnsley Metropolitan Borough Council as part of a formal collaboration. The collaboration required a methodology to be developed for Barnsley Metropolitan Council in preparation for the proposed implementation of Part IIA. A strategy framework was developed using a methodology that can prioritise sites for further investigation. The methodology was tested on a small area of the Borough in order to determine the potential number of contaminated sites that may require further investigation and identify future resource implications. The concluding part of this Chapter briefly examines the strategy adopted by Barnsley MBC in February 2002 and assesses progress at the time of completing this thesis (December 2003). Finally the Chapter presents the findings of the pilot study based on the aims and objectives set by Barnsley MBC and those of the wider research programme.

On completion of the Barnsley Pilot Study a research opportunity arose that would involve examining brownfield policy in Cleveland, Ohio. USA. Using research aims and objectives identified from literature and the Barnsley Pilot Study, a research proposal was put to the Royal Institution of Chartered Surveyors' Education Trust Fund in order to obtain partial funding for a comparative study. The purpose of the field trip was to compare policy approaches in relation to the regulation and redevelopment of contaminated land in Cleveland, Ohio and England.

The comparative study was primarily based in Cleveland, Ohio with the guidance and support of Dr Robert Simons of the Levin College of Urban Affairs at Cleveland State University. Interviews were held with local, regional and federal regulators and relevant economic regeneration co-coordinators. Site visits were made to a number of key sites remediated as part of the brownfield regeneration initiative in Cleveland.

Chapter Seven provides a brief overview of the legislative framework in the USA and the way in which it has been applied in Cleveland, Ohio. The Chapter describes the approach adopted by Ohio State to encourage redevelopment of brownfield land by voluntary means. Finally the Chapter assesses the policy approach to the regulation and redevelopment of brownfield land in Cleveland and the potential areas of policy that could be beneficial in England.

Chapter Eight presents a critical analysis of the contaminated land regulatory process by reference to two case study sites located in Sheffield. The first case study examines the risk assessment of a potential Part IIA site where a residential estate in Sheffield had been developed on an area of infilled ground of approximately 700hectares. The site had been identified just prior to the implementation of Part IIA and the local authority was concerned about potential health risks and liabilities. The case study highlights the difficulties local authorities face when deciding whether land should be determined as contaminated land.

The second case study of a contaminated land site in Sheffield critically assesses the entire regulatory process from identification of land as

'contaminated land', the risk assessment process and the remediation process. The second case study presented in Chapter Eight relates to a residential housing estate that was developed on a former lead smelting works and rolling mill prior to any requirement for development control. In this case the contaminant was lead, the receptor the female child (0-6) and the pathway was ingestion.

Chapter Nine presents the findings of a focus group discussion, questionnaire survey and face-to-face interview phase of the research. The research process started in December 1998 with a focus group consisting of 12 Local Authority Officers and 1 Environment Agency Officer. All the participants were responsible for regulating contaminated land in their area. At the end of the focus group the participants were asked to complete a short questionnaire and rank issues pertinent to their local authority with respect to the proposed implementation of Part IIA.

Based on the findings of the focus group a questionnaire survey was sent to 150 local authorities, which represents just less than half of all local authorities in England. The response rate to the questionnaire phase was 48%. The failure to achieve a higher response rate was seen to be the result of two factors. First because of delays in issuing the proposed Statutory Guidance and second due to a similar postal survey which unknown to the author, was sent to all the local authorities in England just weeks earlier, with the support of the Chartered Institute of Environmental Health.

Following the formal issuing of the Statutory Guidance on 1st April 2000 an interview phase was undertaken with local authority representatives responsible for regulating contaminated land in the Yorkshire and Humber and East Midlands Regions. The Yorkshire and Humber Region is made up North Yorkshire, South Yorkshire, West Yorkshire, East Yorkshire and Kingston Upon Hull. The East Midlands Region consists of Derbyshire, Nottinghamshire, Lincolnshire, Leicestershire, Northamptonshire and Rutland. There are a total of 61 local authorities in these two regions. Information about local authorities in these sub-regions can be found in Chapter Five.

Forty local authority representatives agreed to participate in this phase of the research. It is argued that these local authorities provide a wide spread in terms of land-use (past and present), size, population, political control and economic regeneration. Lack of progress with the implementation of Part IIA meant that a number of local authorities did not want to participate, either because they had "*done nothing to talk of*" or couldn't spare the time to be interviewed due to resource constraints and other priorities.

The interview phase consisted mainly of face-to-face interviews and the choice of regions was partly due to their proximity to Sheffield. This particular aspect was important because there were various time constraints and financial implications associated with undertaking a wider survey. There was difficulty in arranging suitable appointments with some of the participants that had agreed to take part in the research.

Just prior to completing this thesis in December 2003 a short questionnaire survey was sent out to members of the original focus group and to representatives of local authorities in the Yorkshire and Humber and East Midlands Regions. These results have been compared with the original findings of the focus group and interview phase. The research findings have also referred to secondary data obtained by reference to other studies relating to the preparations of local authorities in relation to Part IIA (e.g. Dunn, 1997, Parkinson 1999, Woodcock 2001, and the Environment Agency September 2002).

Chapter Ten links the findings of the research undertaken as part of this project with the literature review described in Chapters Two, Three and Four. The findings are discussed in relation to the overall research aim and objectives of the research. The research identifies a limited number of positive outcomes and highlights eleven barriers to the effective implementation of Part IIA. For each of these barriers potential solutions are suggested.

Chapter Eleven provides the overall conclusions of the research, which identify a number of potential barriers to the effective implementation of Part IIA by local

authorities in England and suggests potential solutions. This Chapter also identifies possibilities for future research.

CHAPTER 2

THE UK CONTAMINATED LAND POLICY FRAMEWORK

> *"Policy issues and the methods of devising suitable regulatory systems find very few publicists, probably because they seem less exciting and important. Yet it is precisely these more 'boring' subjects which primarily determine whether clean-ups of contaminated land are necessary at all, the soil quality levels which have to be achieved in reclamations, and the ultimate remediation costs which the state, private organisations or individuals will have to bear"* (Cairney & Dobson, 1998:10)

2.1 INTRODUCTION

A new policy framework for the identification and remediation of contaminated land in the UK was introduced following Royal Assent of the Environment Act 1995. S.57 of the Environment Act 1995 retrospectively inserted Part IIA into the Environmental Protection Act 1990. Part IIA provides the primary legislation for the regulation of Contaminated Land and is supported by additional Statutory Guidance. The provisions of Part IIA were brought into effect when supporting Statutory Guidance was issued by the Secretary of State for the Environment on 1st April 2000.

Part IIA which is largely based on existing Statutory Nuisance Legislation contained in Part III of the EPA 1990, requires local authorities to identify contaminated land in their area and provides a mechanism to secure remediation, and rules with which to determine liabilities. It is an objective of this research to evaluate whether the mechanisms put in place following the introduction of Part IIA are adequate to enable local authorities to undertake there statutory obligation with respect to contaminated land.

Current contaminated land policy in the UK has largely been developed following a critical report made by the House of Commons Select Committee for the Environment in 1990 (the Rossi Report) (House of Commons, 1990). This Chapter examines the requirements of Part IIA of the Environmental Protection Act 1990, the formation of UK contaminated land policy as it is today and looks at alternative policy approaches adopted in the United States and other countries in the European Union. The policy approach adopted in the United

States is considered further in Chapter 7, which looks specifically at the identification and remediation of contaminated land in Cleveland, Ohio.

2.2 CONTAMINATED LAND POLICY DEVELOPMENTS IN THE UK

In the early 1970s a number of local authorities encountered problems with the redevelopment of industrial land due to the presence of contamination (Harris, 1987:10). In response, the Department of the Environment (DoE) established the Interdepartmental Committee for the Redevelopment of Contaminated Land (ICRCL) in 1976. The ICRCL brief was:

> *"to consider the problems associated with the redevelopment of land which may be contaminated by harmful substances, the potential hazards to construction workers, subsequent occupiers of the site, and to buildings on the site" (ICRCL 59/83, 1987)*

The ICRCL produced a number of reports relating to the development of specific sites e.g. scrap-yards and landfills, as well as producing a baseline for determining whether remedial measures would be required on a development (i.e. ICRCL, 59/83, 1987).

2.2.1 The Control of Pollution Act 1974

Prior to the formation of the ICRCL the Control of Pollution Act (COPA) 1974 was brought into force. The COPA, 1974 consolidated powers contained in the Public Health Act 1936, the Clean Air Act 1956 and provided local authorities with powers to deal with statutory nuisances in their area that could be prejudicial to health. These powers that were later inserted into Part III of the Environmental Protection Act 1990 (S.79 – 81) specifically covered housing, food, disease control, air pollution, noise and health in the work place. The statutory nuisance provisions were not designed to deal with historic land contamination.

COPA 1974 also required waste disposal sites to be licensed for specific wastes. Prior to this time many waste disposal sites will have accepted waste materials, which are not recorded and may be potentially contaminated land sites that need to be investigated by local authorities. No legislative powers

were considered at this time in the UK to deal with hazards to human health or the environment, from land affected by the presence of historic contamination.

2.2.2 The Environmental Protection Act 1990 (S.79 – 81) The Statutory Nuisance Provisions

Much of the primary legislation within Part IIA of the Environmental Protection Act 1990 has been developed out of the statutory nuisance powers contained within S.79 – 81 of the EPA 1990. The Statutory nuisance legislation provides local authorities with powers to deal with on-going pollution by the present owner or occupier and was not designed to deal with pollution caused by previous owners.

Where a local authority is able to establish that a nuisance has not been abated and there is the continuing potential for harm to human health enforcement action can be taken. However, fines are limited to a maximum of £20,000 under this legislation. This could lead to polluters paying the maximum fine and then 'walking-away' from the pollution. The United Kingdom Environmental Law Association, in its evidence to the Second House of Commons Select Committee for the Environment, stated that approximately one case every ten years would be brought to deal with a contaminated site using the Statutory Nuisance provisions. (House of Commons, 1990:para 20:13)

The Environment Act 1995 (Para 89, Schedule 22) amended the statutory nuisance legislation. S.79 (1A) states that:

> "*No matter shall constitute a statutory nuisance to the extent that it consists of, or is caused by, any land being in a contaminative state*"

This has the effect of removing land in a 'contaminative state' from consideration under Statutory Nuisance Legislation. There are still some limited circumstances where the statutory nuisance provisions apply:

- *"Where an abatement notice under S80 (1), or an order of the court under S.82 (2)(a), has already been issued and is still in force"* (DETR, 2000a:para62:16)
- *Where "the effects of deposits of substances on land which give rise to such offence to human senses (such as stenches) as to constitute a nuisance, since the exclusion of the*

statutory nuisance regime applies only to harm and the pollution of controlled waters. (DETR, 2000a:para63:16)

2.2.3 The Redevelopment Of Potentially Contaminated Land in the 1980s

Policy in the UK through the 1980s was that contamination could be dealt with through the redevelopment for new uses (ICRCL, 59/83, 1987:4). During this period there were a number of important developments in respect of contaminated land policy, but no specific legislation was created to deal with contaminated land. Table 1 below shows the policy development in the UK from the mid 1970s to the present.

Table 1 Policy Developments in the UK from the mid 1970s to the Present

1976	The establishment of the Inter-Departmental Committee on the Redevelopment of Contaminated Land (ICRCL)
1983	ICRCL publishes Guidance on the Assessment and Redevelopment of Contaminated Land
1987	ICRCL produces a second edition with slight amendments on the Guidance on the Assessment and Redevelopment of Contaminated Land.
1990	First Report of the House of Commons Select Committee on the Environment relating to contaminated land.
1990	Contaminated Land – The Governments response to the House of Commons Select committee report
1990	This Common Inheritance
1991	The Environmental Protection Act 1990 brought into force
1991	Public registers of Land which may be contaminated
July 1992	Draft Statutory Instrument Environmental Protection
March 1993	S.143 Withdrawn by government
July 1994	Planning policy Guidance Note 23 Planning and Pollution Control
March 1994	Paying for our Past
Nov 1994	Framework for contaminated land
July 1995	The Environment Act 1995
Jan 1996	Technical Guidelines for dealing with contaminated sites due to be published January 1996, delayed by the Government
Feb 1996	Working Draft of Statutory guidance issued
June 1996	Second working Draft Issued
Sept 1996	Public Consultation Draft of Statutory guidance published
Dec 1996	Second Report on contaminated land by the house of commons select committee on the Environment.
May 1997	Change of Government followed by a change from DoE to DETR
Dec 1997	Review of Contaminated Land Regime Complete – which identified a requirement for additional funding.
July 1998	Funding put in place for Contaminated Land Regime following the Government Comprehensive Spending Review
Oct 1998	Limited Consultation to representative bodies
Oct 1999	Short 'minded to issue' public consultation.
April 2000	Statutory Guidance issued by government.
April 2002	CLEA Model and accompanying guidance issued by DEFRA and the Environment Agency
March 2002	Draft Planning Policy Advice Note issued by DTLR
Nov 2003	Water Act 2003 Changes contaminated land in relation to the pollution of controlled waters, by introducing the notion of 'significance.

Sources: Syms, 1997:14-15, DETR, 1998., DETR 2000., DEFRA 2002

> *"initiatives were taken in the mid to late 1980s [in the UK] to ensure that contaminated land was identified well in advance of any action to redevelop it for another use, and that appropriate measures were in place to ensure safe redevelopment. In 1985 modifications were made to the Building Regulations to ensure the potential for hazardous substances in the ground was taken into account in building projects, and in 1987, Government guidance to local planning authorities advised that the presence of, or potential for, contamination was a 'material planning consideration' for planning purposes. In 1988, the British Standards Institution published a draft for Development Code of practice on the identification and investigation of potentially contaminated land".* (*cf.* Harris & Denner, 1998:27-28).

Therefore, towards the end of the 1980s new developments on sites with the potential to be contaminated had to be assessed as part of the planning and building control process. There was also draft guidance on the identification and investigation of contaminated land. It is argued that by this time the foundations of UK policy with respect to land contamination were in place. However, there were gaps in the information available to policy makers regulators and developers. There was little accurate information on the amount of land affected by contamination, no apparent scientific procedure for deciding whether a site proposed a risk and required remediation and other procedural guidance remained in draft form. During the period between the late 1980s and the present there have been a series of refinements and modifications to policy and guidance.

2.2.4 Early Proposals for the Identification of Contaminated Land

Contaminated land policy in the UK was evaluated in 1990 by *The House of Commons Select Committee on the Environment.* The 1990 inquiry report, based on both oral and written submissions, was heavily critical of certain aspects of UK Government policy. The main criticisms were:

- *The narrow working definition of contaminated land which referred only to that land which is contaminated and 'potentially available for development', thus apparently excluding other categories of contaminated land already in use and land affected by the migration of contaminants.*
- *The lack of reliable information on the scale, nature and distribution of contaminated land in the UK.*
- *The failure to encourage active consideration of the wider environmental protection*

(House of Commons Select Committee, 1990:1-3)

The House of Commons Select Committee recommended that "the government bring forward legislation 'to lay on local authorities a duty to seek out and compile registers of contaminated land'." (DoE, 1990c:23(85)) However, due to

the cost implications, the government at the time largely ignored these recommendations and opted for a "system of registering potentially contaminated land identified on the basis of the 'contaminative' potential of former or current uses." (CIRIA, 1995:9)

The proposed system of registering land was introduced by Section 143 of the Environmental Protection Act 1990. S.143 was intended to be brought into effect at a later date following further guidance been issued by the Secretary of State. In May 1991 the government issued a consultation paper *Public Registers of Land Which may be Contaminated* (DoE, 1991). This paper provided details of how local authorities were to compile information relating to contaminated land. The consultation paper provided a list of 42 potentially polluting industrial activities. As well as highlighting heavy industrial activities, the list also included dry cleaners and printers. If a local authority identified that any of these uses had previously existed then the site would be placed on a register of *potentially* contaminated land use irrespective of whether the site was *actually* contaminated. The original proposals also offered no right of appeal against the local authority inclusion of a site on the register.

The requirement to produce registers of potentially contaminated would not have the same financial implications for local authorities as physically identifying contaminated land and requiring remedial action as proposed by Part IIA. The suggested financial implications per local authority for the compilation of the registers of potential contamination was originally estimated by the DoE to be £40,000. The findings from this research suggest that the budget provision within many local authorities for implementing Part IIA is significantly less than this amount.

The proposed registers were introduced at a time when the property market in the UK had seen a significant drop in values. The proposal to establish registers of potentially contaminated land sent shockwaves through the property industry and funding institutions, which feared that properties would be 'blighted' by appearing on these registers, even though they were actually not contaminated.

Following strong opposition from a number of institutions, including the Royal Institution of Chartered Surveyors and British Property Federation (Syms, 1997:48), the Government altered its original proposal. The number of land uses were reduced from 42 to 8 and would affect only 10 - 15% of the land area covered by the original proposal (DoE, 1992). There would be no right of appeal and the Government stated that it reserved the right to add other uses in the future. Following continued opposition, the registers proposal was withdrawn by the Government in March 1993 along with the announcement that an interdepartmental review of contaminated land policies would be undertaken (DoE, 1993).

2.2.5 The Identification of Contaminated Land Consultation Process

Following the withdrawal of the proposed registers of potentially contaminated land the government issued a number of important consultation and policy documents. In March 1994 the Government issued a consultation paper *Paying for our Past* (DoE, 1994a) the purpose of which was to get the "informed and structured views of interested parties on the key issues" (DoE, 1994a:3). There were over 300 responses to this consultation, the conclusions of which were presented in *Framework for Contaminated Land* (DoE, 1994c). In this document the government recognised the need for 'a system of regulation and control of land affected by contamination' and proposed that existing statutory nuisance legislation (Part III EPA, 1990) be replaced in respect of contaminated land in order to create a 'specific contaminated land power' (DoE, 1995:7).

Framework for Contaminated Land provided the cornerstone of current UK contaminated land policy. It stated that the UK was dedicated to the suitable for use policy and the polluter pays principle. It recognised that a system would need to be put in place to enable local authorities to identify potentially contaminated sites, with informed knowledge about those sites being available to the public.

This system of regulation was provided by S.57 of the Environment Act 1995. S.57 of the Environment Act 1995 retrospectively inserted Part IIA into the Environmental Protection Act 1990. Part IIA is supported by Statutory

Guidance, which was finally issued on 1st April 2000 following a lengthy consultation process.

2.2.6 The Statutory Guidance – Consultation Process

A draft version of supporting Statutory Guidance was issued for consultation in September 1996. The draft Statutory Guidance provided further information relating to the statutory definition of contaminated land and information relating to the identification and remediation of contaminated land. The Draft Statutory Guidance stated that local authorities should "prepare, publish and adopt a formal written strategy....within 15 months of the issuing of the statutory guidance" (DoE Sept 1996:para 5:2). The Draft statutory guidance also provided specific information relating to liability for historic contamination and guidance relating to special sites. At the time of issuing the Draft Consultation document no additional resources were to be provided to local authorities.

There were over 400 responses to this round of consultation. These consultation responses were examined in detail by the author as part of this research (see letter from DETR in Appendix 5). A significant proportion of the consultation responses came from local authorities. Many of the comments related to the style and layout of the document. More importantly, concerns were raised about the lack of any additional funding from central government to undertake the new requirements of the legislation. Chapter nine includes a summary of some of the consultation responses.

2.2.7 The Second House of Commons Select Committee Report

The House of Commons Select Committee for the Environment considered the consultation Draft of the Statutory Guidance in October 1996. Evidence was given by representatives of the following: The Department of the Environment; The United Kingdom Law Association; The Environment Agency; The Local Authority Association and The Royal Institution of Chartered Surveyors. Other evidence was reported to the Select Committee from the organisations and individuals shown in Box 1 below:

Box 1. List of Organisations and Individuals that Supplied Memoranda to the Select Committee

Association of British Insurers	Environmental Industries Commission
British Bankers Association	Eversheds
British Gas	Friends of the Earth
Confederation of British Industry	Richard Hawkins
Country Landowners Association	London Borough of Hackney
Hammond Suddards Solicitors	National Playing Fields Association
National Trust	Railtrack
Communities against Toxics	Soil and Groundwater Technology Association
Southampton Institute Law Research Centre	Paul Syms Associates
Scottish Office	Environmental Compliance Services
Council of Mortgage Lenders	

Source: House of Commons, 1996:43

The House of Commons Select Committee on the Environment in its second report on contaminated land identified 26 separate recommendations. A number of the recommendations related to the layout and wording of specific parts of the guidance document. Box 2 below highlights some of the recommendations made by the Select Committee.

Box 2. Summary of Recommendations made by the Environment Select Committee

- The Government review local authorities plea for additional funding
- In order to avoid the danger of 'blight' the DoE should set a deadline within which local authorities would be required to complete the first inspection of potentially contaminated areas identified in their inspection strategy.
- Local authorities improve their co-operation with each other, so that local authorities which lack expertise in contaminated land can purchase it from those authorities with significant expertise and experience
- Greater clarity be provided relating to the definition of contaminated land where controlled waters are threatened.
- It would not be possible to have a formal 'signing-off' mechanism due to the many different types of sites that may be encountered and suggests that insurance may be more appropriate.
- In order to avoid confusion the statutory guidance clearly states that the Part IIA regime only affects land in its current use, and that it should not conflict with any regeneration policy.

Source: House of Commons 1996:5-8

It was noted that local authorities generally welcomed the new contaminated land powers. However, it was suggested that the effective implementation would be dependent upon the "perceived need for considerable additional

funding from Central Government." (House Commons Select Committee Report, 1997:30).

Even though the Government had stated that it was satisfied that the legislation would effectively deal with contaminated land and identified funding to assist local authorities, no date was set for issuing the Statutory Guidance. There was a limited consultation with relevant organisations in October 1998 at which time the Statutory Guidance was further revised (DETR, October 1999). In October 1999 the Government sought comments from all interested parties on a 'minded to issue' version of the Statutory Guidance. The final version of the Statutory Guidance was issued on 1st April 2000 at which time local authorities had fifteen months to produce an inspection strategy (DETR 2000a:para 3.2:21).

2.3 THE DEFINITION OF CONTAMINATED LAND

In the UK, land contamination and the potential hazard that it poses have synonymously been linked with the use of the land in its current or future use. Different definitions have been suggested by various stakeholders (Smith 1985, DoE 1987, BSI, 1988), but a formal definition was not adopted in the UK until the introduction of Part IIA of the Environmental Protection Act 1990.

The first House of Commons select committee report was critical of the narrow working definition of contaminated land and the lack of any reliable data on the amount of contaminated land. Early definitions of contaminated land were restricted to land that was potentially available for development and excluded the effects of contamination on the wider environment.

Part IIA provides the first legal definition of contaminated land in the UK. Contaminated land is defined by Part IIA, S.78A (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]"

[1] Just prior to the completion of this thesis, the Water Act 2003 received Royal Assent. The Water Act (Clause, No 79) has the effect of amending the definition of contaminated land under

The inclusion of the word significant does provide a narrow definition of contaminated land but also considers other potential receptors such as controlled waters. A number of the consultees to the draft statutory guidance referred to the narrow definition of contaminated land and recommended that it should be widened to include land that is merely capable of causing harm. This response was received from environmental groups such as Friend of the Earth and a small number of local authorities.

2.4 SPECIAL SITES

Local authorities are the primary regulators of contaminated land. Part IIA also introduces the concept of 'special sites' (S.78A (3). These are sites that will be regulated by the Environment Agency (in England and Wales). Where a special site has been identified the Environment Agency are responsible for further regulatory action. The Environment Agency will regulate sites that are causing pollution of controlled waters, waste acid tar lagoons, oil refineries, explosives sites, IPPC sites and nuclear sites (DETR, 2000a: 135).

2.5 THE POLLUTER PAYS PRINCIPLE

The UK is committed to the *polluter pays principle* and Part IIA has a procedure for identifying who should be responsible for the remediation of a site identified as contaminated land (See Section 3.7).

The polluter pays principle seems reasonable in relation to current pollution incidents, although the principle may seem unfair when applied retrospectively to companies who have caused contamination using practices that were seen to be acceptable at the time. The RICS in a response to *Paying for our Past* (DoE, 1994) suggested that it would be unfair to make companies liable for contamination even though it complied with all available regulation in force at the time (RICS, March 1994).

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section 78A(2) of Part IIA. The word "significant" has been inserted prior to the words "pollution of controlled waters". DEFRA state on their website that further statutory guidance will be issued on as to what water pollution is "significant".

In circumstances where land is not currently used for housing, the easiest way for a potentially liable person to deal with potentially contaminated land without having to pay is through the redevelopment process. Potentially contaminated land may be sold to developers, which subject to the relevant planning permission can redevelop that land and bring it back into beneficial use. Depending on the proposed end use there are fiscal incentives, which are intended to assist in the regeneration of land affected by contamination, such as the Contaminated Land Tax Credit and Landfill Tax Credit. Where the land being redeveloped falls within one of the 20% most deprived wards in the UK, purchasers are exempt from Stamp Duty[2]. This will provide an additional incentive to developers considering developing potentially contaminated land in those areas.

The findings of this research identify a significant increase in the amount of developments coming through the planning system that need contaminated land site investigations to be reviewed by local authorities. In some circumstances where a landowner has sold potentially contaminated land for redevelopment purposes it will not be the polluter who pays for the remediation. The fiscal incentives available from the government to assist in the regeneration of potentially contaminated sites will potentially mean that in some cases the landowner can leverage a higher price for his land than may otherwise have been the case.

2.6 THE AMOUNT AND DISTRIBUTION OF CONTAMINATED LAND

Early attempts when producing estimates of potentially contaminated land related to the lack of an accepted definition. Indeed the lack of agreed definition and lack of information about the amount of contaminated land was one of the main criticisms of the First House of Commons Select Committee.

The DoE had information relating to derelict land, based on local authority Derelict Land Surveys undertaken in the late 1980s. Derelict land was defined by the DoE as:

[2] For residential properties sold for less than £150,000. For commercial properties there is no price ceiling.

"land so damaged by industrial or other development that it is incapable of beneficial use without treatment". (DoE, 1986:2).

Some, but not all, derelict land may be affected by the presence of contamination. The Derelict Land Survey only provided part of the information about the potential number of contaminated sites. The DoE estimated that over 50% of all derelict land could be contaminated (DoE, 1990:92).

A definition adopted by the British Standards Institute in the *[Draft] Code of Practice for the Identification of Potentially Contaminated Land and its Investigation* (BSI, 1988) made a distinction between the current and future use of the land. The BSI defined potentially contaminated land as:

> "*Land that, because of its nature or former uses, may contain substances that could give rise to hazards likely to affect a proposed form of development*" (BSI 1988:4)

The BSI [Draft] Code of Practice also stated that

> "*Many contaminated sites would present no hazards to their users or occupiers because the users are 'tolerant' of the contamination. For example, high concentrations of metals present fewer risks to industrial or commercial development, although attention may still have to be paid to landscaped areas, protection of water supplies and potential aggressivity to building materials*"' (BSI, 1988:4)

In relation to future development of a contaminated site the BSI Code of Practice suggested that:

> "*the optimum solution will be achieved by choosing the form of development which is most tolerant of the contamination present*"

Other attempts at defining contaminated land included:

> "*Land that contains substances that, when present in sufficient quantities or concentrations, are likely to cause harm, directly or indirectly, to man, the environment, or on other occasions to other targets.*" (Smith, 1985: 1)

This definition was adopted for the purposes of the NATO Committee for Challenges to Modern Society Pilot Study on Contaminated Land. This

definition was also adopted by the Welsh Development Agency in developing its *Manual on the Remediation of Contaminated Land* (WDA, 1993:1.3).

According to Smith (1985) the CCMS definition:

- *"[Places] the emphasis is on the presence of potentially harmful contaminants rather than on past use*
- *Embraces both old industrial sites that have become contaminated owing to their former usage, and hazardous waste 'problem' sites (OECD) or 'uncontrolled hazardous waste sites (US Environmental Protection Agency)*
- *Implies that a 'problem' is only defined to exist following a proper site investigation and after the evaluation of all available information specific to the site and taking into account the intended use"*

(Source :Smith, 1985:1)

The NATO CCMS definition is actually very close to the definition of *contaminated land* as defined in Part IIA of the EPA 1990 (see pg.21). The clear differences being that it relates to future use and that it does not include the notion of *significant harm.*

The Department of the Environment adopted the following definition of contaminated land:

> "(i) *Land which because of its former uses now contains substances that give rise to the principal hazards likely to affect the proposed form of development, and which*
> *(ii) Requires an assessment to decide whether the chosen development may proceed safely or whether it requires some form of remedial action, which may include changing the layout or form of the development.*" (Harris, 1987:12)

All of the above definitions are linked to future use. Land that is contaminated in its current use would not be capable of being classified as contaminated land. The above definitions also limit contaminated land to sites where there has been a known former use. Therefore a hazard that exists as a result of geological formations or windblown deposition would not be classified as contaminated land.

> *"Previous estimates of the extent of land affected by contamination vary widely, from 50,000 to 300,000 hectares, amounting to as many as 100,000 sites"* (Environment Agency, September 2002:7).

Solicitors, Hammond Suddards, in their evidence to the Second House of Commons Select Committee review of contaminated land, estimated that

100,000 to 200,000 hectares of land represent "an actual or potential hazard to health or the environment as a result of previous use" (Select Committee, 1996: 12-13).

Inclusion of the word 'significant' in the definition of contaminated land introduced by Part IIA is important as it reduces the amount of land capable of being identified as contaminated. It has been estimated by Syms (1997:289) that there may only be 2800 hectares of land capable of being classified as contaminated. Denner estimated in 1999 that there would be approximately 9800 hectares capable of being classified as contaminated (Denner in a statement at a conference 12/2/1999).

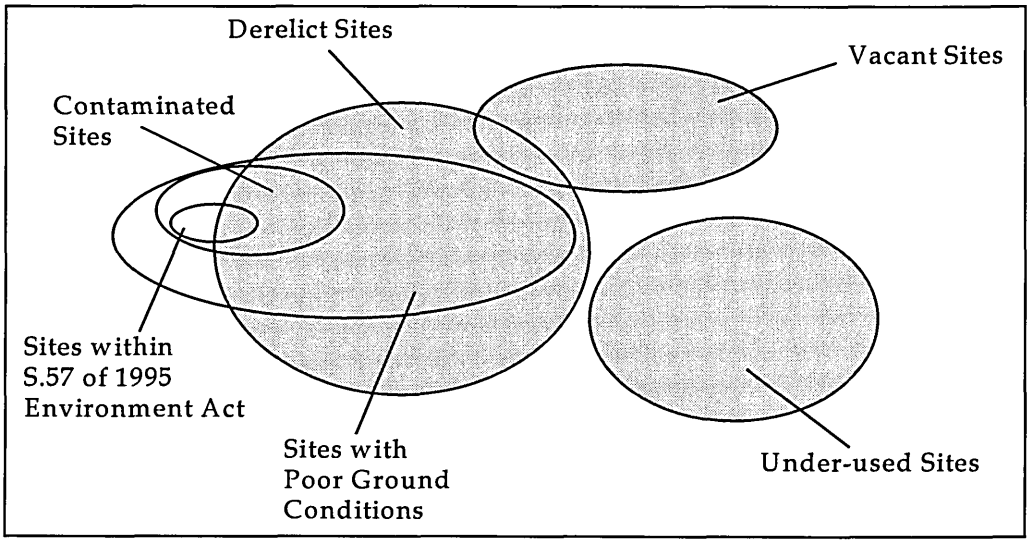
Nathanail (1999) states that:

> *"In other countries which have compiled registers of contaminated land, 10% of sites that had been put to a potentially contaminative use were found to be a problem. If this pattern is repeated in the UK, we may anticipate some 5000 – 25,000 problematic sites."* (Nathanail, 1999:1)

More recent estimates in the Environment Agency Report *Dealing with Contaminated Land in England* (Environment Agency September 2002:7) estimates that there will be somewhere between 5000 and 20000 hectares that fall within the legal definition of contaminated land. A discussion relating to the way in which 'significant harm' is quantified and determined follows in Chapter Three.

There have been a number of attempts to try and show the relationship between the various definitions of contaminated land and previous use diagrammatically. Figure 1 shows the relationship between brownfield sites and other land as depicted in the POST report *A Brown and Pleasant Land* (POST,1998:2:Figure 1.1). In the POST report, Brownfield land is shown by the shaded areas and the figures are not proportional to the land meeting each definition.

Figure 1 Contaminated Land in Context



Source: Based on POST, 1998:2

Due to the narrow definition of contaminated land there is the significant possibility that Part IIA will not have a major impact in remediating contaminated land. In his evidence to the House of Commons Environment Select Committee, environmental lawyer Richard Hawkins alleged that there was no environmental need for the new regime:

> *"I still remain of the opinion that the cost of all this work is not justified by any present definable benefit...If the Statutory Nuisance provisions, however, had been enforced properly, that would have been adequate."* (House of Commons, 1996:103)

A similar situation exists in the United States and is described in Chapter Seven. In the United States there is not a requirement to proactively identify contaminated land, but there is legislation in place to deal with any remediation actions and cost recovery. The problem with the Statutory Nuisance legislation related to the fact that it did not provide a suitable mechanism of cost recovery from historic polluters and did not deal with the effects of contamination on the wider environment.

2.7 THE 'WIDER' DEFINITION OF CONTAMINATED LAND

Previous definitions of contaminated land were concerned only with harm to human health. The current definition is slightly broader in that local authorities are required to determine whether land affected by contamination is causing significant harm to specified ecosystems, property and controlled waters. The

ecosystems and property covered by Part IIA are shown in Table 7 (Chapter Three, page 60). Local authorities as part of their strategies are required to consult with relevant bodies such as English Nature and English Heritage. However, at the present time there is a lack of published guidance on the harmful effects of contaminants on habitats and property and it is suggested that local authorities are unlikely to be dealing with such sites as a main priority.

Where land affected by contamination is causing pollution of controlled waters, local authorities should to consult with the Environment Agency (DETR, 2000: para B.26: pg 82). The Environment Agency appears to have already provided a significant amount of assistance to local authorities in establishing whether pollution of controlled waters is occurring. In the Environment Agency's Progress report dated July 2003 they stated that they were committed to providing assistance to 65 local authorities. Unlike local authorities the Environment Agency is provided with an allocated amount of Supplementary Credit Approval (SCA) which enables it to plan how this money can be used to assist local authorities.

The re-use of 'brownfield' land and the way in which policy planners allocate land use is currently the focus of a considerable amount of attention. Much of this attention follows the government's green paper *Household Growth Where Shall We Live?* (DETR, 1996:1) which sets an aspirational target that 60% of new homes should be built on previously used land. Coupled with a green belt policy which restricts growth outwards from the inner cities, developers and planners are now having to identify which previously used sites are suitable for re-development. The statutory guidance states that wherever possible that land should be cleaned-up on a voluntary basis. However, for a number of landowners there may be significant barriers to the re-use of contaminated land for new development.

Part IIA of the Environmental Protection Act 1990 provides local authorities with powers to ensure that land in its current use is suitable for use. It is government policy that wherever possible, land contamination should be dealt with through new developments and regulated through the planning system (DoE, 1994, DETR, 2000a). In addition, where contaminated land is identified under the

Part IIA regime and the local authority is satisfied that appropriate remediation is being undertaken, then regulatory action cannot be taken (DTLR, 2002:4). Local authorities have in the past been inconsistent in their approach towards the remediation and assessment of land contamination (Syms, 1997a:65). In an interview held with Malcolm Lowe in July 2000 he stated that:

> *"one of the key drivers for the liability regime was to clarify the rules that would apply if it all went horribly wrong so that people could then develop a new site because they new what the rules would be and they would have a target to miss, and that was always a key component of devising the new regime, was to define the rules for other circumstances. So although the new regime isn't about promoting development directly, it is there to underpin it.* (Malcolm Lowe, July 2000)

Local authorities are required to consider the potential for contamination to be present on any development (DoE, 1987, DoE, 1994, DTLR, 2002). This consideration will address land contamination on developments undertaken to avoid enforcement action under Part IIA, as well as other developments proposed to fulfil the requirements of the market.

Where any development is proposed it is the responsibility of the developer to ensure that a development is safe and suitable for use (DoE, 1994:Annex 10: para 3, DTLR, 2002:4). Current guidance for local authorities in relation to developments on land is contained in Planning Policy Guidance Note 23 *Planning and Pollution Control* (DoE, 1994). The Department issued a draft planning technical advice note for consultation for Transport Local Government and the Regions in February 2002 entitled *Development on Land Affected by Contamination* (DTLR, 2002).

The stated purpose of the new technical advice note would be to:

> "*Explain the relationship of the contaminated land regime to the planning regime. It applies its broad approach, concepts and principles, to the planning making and development control system. The aim is to help all those involved ensure that land contamination issues arising in the context of development plans and planning applications are properly addressed and are consistent with the contaminated land arrangements. This recognizes that the most economical way to deal with contaminated land will be by redevelopment and that appropriate release of previously developed land requires the potential for contamination to be considered*". (DTLR, 2002:1)

At the time of completing this thesis, the government is considering amendments to the planning policy regime and has not yet adopted the above technical advice note, which was the subject of consultation. It was reported at a YAHPAC Land-Sub meeting held 18th November 2003, that the Government

was considering issuing the contaminated land planning guidance as a planning policy statement. The new planning policy statement is to be issued when the government completes its review of the current planning guidance. Therefore at the present time local authorities are still having regard to Annex 10 in PPG 23 (DoE, 1994c) which does not provide a sufficient link between the planning regime and Part IIA.

Local authorities and risk assessors are all likely to face difficultly in assessing whether land is capable of causing *harm* to end users. Current available guidance relates to the potential for *significant harm* and is only available for a limited number of contaminants. There are likely to be delays in the planning process while risk assessors and local authority officers discuss the acceptability of clean-up criteria. At the present time there is no official policy or guidance available to local authorities and consultants which provides acceptable remediation strategies for different risk scenarios.

Just Prior to submitting this thesis a draft guide, prepared by RSK ENSR Ltd on behalf of the Association of Geotechnical and Geo-environmental Specialists in partnership with BRE was released for consultation. The guide entitled "*Cover systems for land regeneration - thickness of cover systems for contaminated land*" is aimed at helping regulators and developers assess the need for cover systems to reduce exposure to contamination, and to provide an indication as to the required thickness of cover. The publication attempts to provide a link between the risk assessment and remediation standard required at different types of site. It is not yet clear whether regulators will accept remediation cover layers based on this model, but if it receives the support of DEFRA and the Environment Agency, it is likely to promote consistency of approach between local authorities.

2.8 FINANCING THE LEGISLATION

At the time of the first Environmental Select Committee enquiry, neither the DoE nor the Local Authority Association were able to estimate the likely additional cost of implementing the new regime. Portsmouth City Council had suggested that it would cost them £87,000 to set up the necessary information. DoE produced an estimate of £12million for administrative costs, which equates to less than £35,000 per authority. The Local Authority Association provided a figure of £50,000 per authority, which they estimated would cover the initial cost of compiling an inspection strategy. It was noted that the Government had allocated £40,000 for the withdrawn proposals for S.143 registers. Both the RICS and the Local Authority Association felt that this amount was "totally inadequate" (House Of Commons Select Committee Report, 1997:31). Given the additional requirements of Part IIA in comparison with the formulation of S.143 registers, it may be that the Local Authority Association estimate as to the likely cost of implementation is considerably less than it ought to be.

> *"One of the first key decisions that was taken before we had the change of government in 1997 was to actually say 'well look we actually need to resource this some more'. Because you can make the case that local authorities aren't doing enough. Requiring them to do what they should be doing properly actually requires more money than they are currently deploying. So that got fed into the wish list in the Comprehensive Spending Review in 1998".* (Interview with Malcolm Lowe, June 2000)

It was originally anticipated that, subject to appropriate amendments as a result of the 1996 consultation process the Part IIA regime would become effective in Spring 1997 (Syms, 1997: 54). However, in May 1997 there was a General Election in the UK and a change in administrative power to a new Labour controlled government. The change in administration also led to a change in the way government departments were structured and the *Department of the Environment* (DoE) became the *Department for the Environment Transport and the Regions* (DETR).

In a written answer to a Parliamentary Question from Louise Ellman MP the Environment Minister, Michael Meacher, stated that the Government had completed its review of the contaminated land regime.

> *"We have concluded that this package of primary legislation and guidance sets out, in principle, broadly the right framework for the protection of human health and the environment, without imposing unnecessary burden on homeowners, landowners, developers or industry. However, it is clear that implementation of the legislation would create significant burdens for local authorities and the Environment Agency. These potential burdens are being considered as part of the Comprehensive Spending Review Process, and the decision on when to bring the regime in to force will not be made until that process has been completed".* (DETR, December 1997)

In a press release by the DETR on 22nd July 1998 Michael Meacher announced that £50 million would be provided over three years to help local authorities develop inspection strategies, in addition to which £45 million would be available for contaminated land clean – up. This £45 million would be made available under the government's Supplementary Credit Approval (SCA) system.

> *"In relation to the numbers....it was to a large extent a wet finger in the wind exercise...The key component was a statement by the then Association of District Councils which said that it would require on average say 1.5 people full time equivalent per authority to take on this responsibility. Well you can cost up 1.5 people and you end up with around £12m a year. That was the number for better or worse that got fed into that component of the spending review. We also looked at what other types of expenditure might be needed. That £12m was related specifically to the revenue costs of employing officers to do this."* (Malcolm Lowe, June 2000)

In his press release he stated that £12 million would be made available in 1999/2000 with £18 million being allocated in the subsequent years. This amount would be added to the overall Standard Spending Assessment (SSA) allocation made to local authorities in order to meet their revenue expenditure in relation to Part IIA.

2.8.1 The Standard Spending Assessment

The revenue funding identified to assist local authorities prepare their strategies was not 'ring-fenced'. This means that money goes into local authorities central funds through the Standard Spending Assessment criteria that is calculated on the basis of a number of factors, including population size, education needs, social services. Due to the fact that the money is allocated within the SSA allocation relevant departments for implementing Part IIA may not be able to obtain sufficient revenue with which to implement the legislation effectively. The findings of this research highlight the difficulties relevant local authority departments have had obtaining the required funding where contaminated land

is seen by members to have very low political importance. The specific reason given for not ring-fencing the revenue allocation was provided by Malcolm Lowe in an interview held in June 2000:

> *"It is fundamental government doctrines. The agreement between central government and the local government association is that in general funding should be provided as local grant support built in to the Standard Spending Assessment. Then there is local and political accountability as to how that money is spent. Ring-fencing takes away responsibilities, removes accountability and is to that extent a bad thing. The other point within it is that if you are producing ring-fenced amounts of money - you would really be trying to get horribly specific on what any individual authority needed to spend. Nobody yet has got anywhere near what would be a predictive formula that any authority might need to spend on regulating contaminated land". Interview with Malcolm Lowe June 2000)*

Other methods of funding the implementation of Part IIA have been discussed by government. In response to a question about raising a special tax to deal with contaminated land and pay for clean-up out of public funds Malcolm Lowe of the DETR stated that:

> *"It would probably be illegal under European law to actually do that.... The competition people in the commission would in all probability say to that kind of funding regime ...it is an unfair subsidy. In fact something very similar has actually happened to the Austrian funding regime - which was designed on the idea of a 50% state contribution - it just got ruled illegal by the European Commission. Now we are currently getting problems on the...land and property development programme through the regional development agencies." (Malcolm Lowe, June 2000)*

In circumstances where contaminated land has been identified, the local authority is required to determine liability and apportion costs between responsible parties. There are a number of circumstances when a local authority may be required to fund all or part of the remediation costs (See page 34). There is Supplementary Credit Approval (SCA) available to local authorities that take the decision to undertake remediation in accordance with S.78N EPA.

2.8.2 The Supplementary Credit Approval Programme

The supplementary Credit Approval programme "*effectively permits a local authority to borrow or take out a credit arrangement in order to acquire a capital asset*" (DEFRA, 2002e).

> "*The revenue implications associated with the cost of borrowing associated with any SCA (i.e. interest payments and repayments of the debt over a 25 year period) are taken into account in Standard Spending Assessments...for individual local authorities in subsequent years*" (DEFRA, 2002e)

SCAs are available for two categories of work. Intrusive investigations and remediation works. The intrusive investigation would be undertaken to establish that the land being investigated is contaminated land (prior to determination). SCA issued for remediation would be made available for "assessment actions, "remedial treatment actions" and "monitoring actions". The SCA programme is quite restrictive for local authorities with regards to how it may be spent. Box 3 highlights when SCA will not be available.

Box 3 Circumstances when SCA is not available

- *to fund remediation works intended to facilitate the sale or redevelopment of land;*
- *to undertake remediation of land where radioactivity is the only source of contamination*
- *to fund remediation works where the land has not been formally determined as contaminated land.*
- *to fund upgrades or improvements to existing pollution control facilities in order to comply with other regulations e.g. to meet new emission controls for landfill gas flares.*
- *to undertake desk study work and other work to collate documentary evidence described in the statutory guidance (DETR 2000a:para B.20(a). (This work is seen by DEFRA to be covered by the revenue funding provided to local authorities).*
- *Insurance premiums relating to long term insurance items. Insurance is seen to be an issue of revenue expenditure.*
- *where the remediation work relates to certain sites licensed under waste management regulation.*

Source: DEFRA 2002e

Local authorities are required to apply each year for supplementary credit approval from DEFRA. Each bid is then assessed by the Environment Agency on its individual merits and, if it meets the relevant criteria, the SCA will be awarded (telephone conversation with Phil Whitaker, Capital Projects Manager at the Environment Agency, 28th March 2003).

At the present time the SCA budget of £15million is under spent. This could be because local authorities have:

- *been unable to identify the relevant person for undertaking remediation and bearing the financial cost;*
- *not yet have progressed sufficiently with their strategy, and therefore not be in a position to inspect land or carry out remediation.*
- *a desire to remain 'debt free'.* (DEFRA, 2002e)

From the author's experience, the timescales relating to SCA expenditure can be quite onerous. From the initial application there can be several weeks before being awarded SCA, followed by a lengthy internal reporting mechanism to relevant Council members before any allocated money can be spent. Depending upon the scheme there may be further delays whilst a formal

tendering exercise is undertaken. The current funding regime will undoubtedly have had a significant impact on local authority progress.

2.9 ALTERNATIVE POLICY APPROACHES

The principle policy upon which UK contaminated land policy has been developed is that Land should be *suitable for use* and *the polluter pays*. An alternative approach known as the *multifunctionality approach* was initially adopted in the United States and the Netherlands. This policy requires contaminated land to be remediated to a standard so that it is suitable for any purpose. For example, land which was to be used for industrial land would have to meet the same criteria as that of a proposed residential development. The multifunctionality approach was initially adopted to be protective of groundwater and human health where the policy regarding acceptable levels of risk was more conservative than the UK. The cost implications and greater understanding regarding certain contaminants has meant a move away from the multifunctionality approach to a more pragmatic risk based approach. The risk assessment framework is largely the same in all developed countries, yet the criteria by which a risk is measured differs from country to country depending on soil conditions, weather, behaviour of population and government policy. This thesis concentrates on policy in the England and the State of Ohio, USA. Broad policy principles, which apply to other European Member States and the United States, are discussed below.

2.9.1 European Member States

Until the Single European Act 1986 came into force, legislation relating to the European Community was limited (Graham, 1995:56). The 1986 Act introduced a number of important environmental principles, such as preference of preventative action to remedial measures rather than remedial measures, and also that the polluter should be responsible for remediation. Using these measures member states were then required to adopt environmental policies which allowed 'sustainable development' to be achieved.

During the Sixth International Conference on Contaminated Land[3] it was clear from a number of workshops and papers presented that most European Member States are working towards a site-specific risk-based approach to the identification of contaminated land. The polluter pays principle has been adopted by most Member states but:

> "*the extent to which that principle is enforced in respect of historic contamination would seem to vary significantly from country to country*". (Syms, 1997:60)

Different approaches are also apparent between countries in relation to the protection from liability offered to the 'innocent landowner' (Syms, 1997:60). A review of individual Member State policies is beyond the scope of this thesis. Further information on individual European Member State policies on contaminated land can be found in the following texts: Syms, 1997:54-59; Connell, 1994:1-22; Nathanail and Judd, 1998). Lowe, J, Laidler, D, Syms, P have undertaken a review of European Policies for English Partnerships and the OPDM, which is expected to be published in 2004.

Hollins and Percy (1998) identified an apparent lack of consensus within the European Community relating to contaminated land liability. The article specifically details different countries interpretations of the 'polluter pays' policy and the lack of Europe-wide legislation dealing with contaminated land. This is true, but by allowing different member states to develop their own policies they are able to take into account differences in geography and economic ability to deal with the problem. Hollins and Percy (1998) suggest the possibility of a European register of contaminated land, but without a fully integrated European Union, such a policy may ultimately have the effect of 'Euro-blight' where countries with more contamination problems do not attract inward investment from multinational corporations. Many large foreign investors fear the possibility of becoming liable for past pollution. This is especially the case with North American companies who have experience of Superfund legislation.

Many large foreign investors are looking at 'greenfield sites' and countries such as the UK who are now restricting greenfield development, through the planning process, may find that large companies go to other countries within Europe.

---

[3] ConSoil '98 Sixth International FZK/TNO conference on contaminated soil, Edinburgh, 17-21 May 1998

The Urban Task Force stated that :

> *"The difficulty for the UK will be that most other European Countries do not have the scale of the problem we face as a result of our industrial past. We therefore need to retain considerable flexibility for the public and private sector to work together in dealing with past contamination. As the condition of land has few cross-border implications, it would seem sensible if most responsibility remained with the Member States on clear grounds of subsidiarity."* (Urban Task Force, 2000:241)

Within the EU there are a number of working parties such as CARACAS (Concerted Action for Contaminated Sites in the European Union), NICOLE (Network for Industrially Contaminated Land in Europe) and CLARINET (Contaminated Land Rehabilitation Network For Environmental Technologies). The purpose of these groups is to establish a common approach to dealing with contaminated land and to exchange ideas relating to remediation, risk assessments, research, technical guidance and Guideline Values. It may be argued that contaminated land can be dealt with effectively without the need for EU legislation and without loss of developer confidence. (Garvin *et al*, 1998, Rouse & Murphy, 1998 and Syms, 1998c)

2.9.2 United States

There are two regulatory regimes designed to deal with the most hazardous sites in the US. The first is the Resource Conservation and Recovery Act (RCRA) introduced in 1976. RCRA enabled regulators and the general public to require cleanup at sites that "*may present an imminent and substantial endangerment to health or the environment" or where hazardous wastes are released in violation of a permit or other requirement of RCRA.*" (Simons:1998:19).

The second regime was passed by US congress in 1980 known as The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLA was the response of the US government to several environmental disasters such as Love Canal in New York State; Stringfellow Acid Pits in California; Valley of Drums in Kentucky among others. CERCLA establishes a retrospective liability scheme for remediation of virtually all contaminated properties (Simons, 1998:19). Unlike RCRA, liability for clean-up is not limited to sites containing an "imminent hazard" but extends to "all sites

contaminated with even modest amounts of one or more hazardous substances". (Simons,1998:19). The Superfund legislation has a very different liability regime to that adopted by the UK. The US approach adopts a policy of *joint and several* liability, rather than the policy of *strict* liability adopted in the UK.

The enforcement of RCRA and CERCLA legislation is undertaken by the State and Regional Environmental Protection Agency (EPA). The EPA's are also responsible for administering *Brownfield Projects* aimed at regenerating contaminated sites. Superfund sites are sites that could fall within the statutory definition of contaminated land within the Part IIA regime. Many Superfund sites could also be similar in characteristics to those identified as 'special sites' and regulated by the Environment Agency in the UK. The Environment Agency have an important role in developing and administering the development of guideline values, delivering training and providing assistance to local authorities regarding matters relating to controlled waters. An alternative policy approach for the could have been for the Environment Agency to have the entire responsibility for enforcing Part IIA.

The policy approach adopted in the United States with an emphasis on how it is applied in the State of Ohio is discussed in greater detail in Chapter Seven.

2.10 SUMMARY AND KEY QUESTIONS

The UK has a legacy of land affected by contamination due to its industrial past. Contaminated land policy in the UK is developed on the two main principles that land should be *suitable for use* and that the *polluter pays.* There are two main mechanisms, through which, contaminated soil can be dealt with. Where land in its *current use* is capable of causing *significant harm* then local authorities have powers using the provisions of Part IIA to remove or treat the contaminated soil so that the land is suitable for use. Land which does not meet the legal definition of contaminated land will not be dealt with under Part IIA. Where land has development potential, contaminated soil will be assessed by the developer as required by PPG 23. Local authorities will then review the

risk assessment undertaken by the developer in order to ensure that future users of the site are not exposed to unacceptable risks.

The UK has adopted a narrow definition of contaminated land and it has been suggested that there may only be a very small amount of land which falls within this definition. This research will therefore try to establish how much land has been or is likely to be determined as contaminated land by local authorities.

The introduction of Part IIA was delayed many times before it was finally brought into effect. Early research findings undertaken as part of this thesis identified that many local authorities had done very little in terms of preparatory work. Having set a baseline this research further set out to evaluate how local authorities intended to prioritise land for further investigation within the present policy framework.

When the Environment Act 1995 received royal assent the government had not proposed any additional financial resources for local authorities. It was clear following the Statutory Guidance consultation process and Second House of Commons Environment Select Committee report that the legislation would have significant financial implications for local authorities. The Comprehensive Spending Review held in July 1998 by a new Labour administration identified a sum of £12 million to be added to local authorities Standard Spending Assessment provision. This literature has highlighted that the additional resource is intended to be the equivalent of 1.5 new members of staff per local authority. However, due to the fact that the money is not 'ringfenced' local authorities may spend the money on other schemes which politically have a higher priority. It is questioned as part of the research whether the departments responsible for administering Part IIA have been able to secure resources to implement Part IIA and whether the current level of resources are sufficient.

Chapter Three reviews the available literature in regarding the assessment of risk on land affected by contamination and evaluates the legal issues faced by local authorities where contaminated land is identified.

CHAPTER 3

THE THEORY OF RISK MANAGEMENT, TECHNICAL GUIDANCE AND LEGAL ISSUES

3.1 INTRODUCTION

Chapter Two highlighted that the UK has adopted a risk-based approach to the regulation and assessment of contaminated land. The main principle of UK policy in relation to contaminated land is that the land should be 'suitable for use' and that the polluter should pay for environmental damage caused as a result of past operations. Contamination in the UK is assessed in relation to its potential to cause harm to human health and/or the wider environment. The level or significance of harm, which may be attributable to a particular contaminant, is assessed according to the risk that it poses. Methodologies for assessing and determining risk associated with land affected by contamination differ internationally. Reasons for this are largely historic and can be attributed to differing geography, and political responses to public health and environmental threats.

Part IIA requires local authorities to assess the possibility of significant harm in relation to a site's *current use.* Where a new development is proposed, an assessment of the potential for harm would also have to be submitted to the local planning authority in accordance with PPG 23. This is to ensure that the development is suitable for its intended use.

Syms (1997) noted that in the past there have been inconsistencies in the way risks have been interpreted by local authorities and developers (Syms, 1997a:21). Following the implementation of Part IIA in April 2000 and the introduction of the *Contaminated Land Exposure Assessment (CLEA) Model* in April 2002 there has been a significant amount of published data relating to the risk assessment of contaminated land.

The stated purpose of this new guidance (CLR 7 – 10) is:

> "*to provide regulators, developers, land owners and other interested parties with relevant, appropriate, authoritative and scientifically based information and advice on the assessment of risks arising from the presence of contamination*" (DEFRA, 2002c:1)

Despite the amount of published guidance that has been produced there is still a significant lack of information regarding acceptable levels of risk from many contaminants. In addition the guidance that has been published relates only to human health and not other receptors. This Chapter critically assesses the theory of risk management as it applies within the context of the strategic processes required by Part IIA. The Chapter also examines the legal requirements with respect to controlling risk from contaminated land and provides an assessment of system of apportioning liability between potentially liable parties. The application of Part IIA by local authorities is likely to be made more difficult by the lack of specific guidance on acceptable values for contaminants in soil and the resource intensive task of identifying the individual proportion land owners should pay with respect to past pollution.

3.2 THE PRINCIPLES OF RISK MANAGEMENT

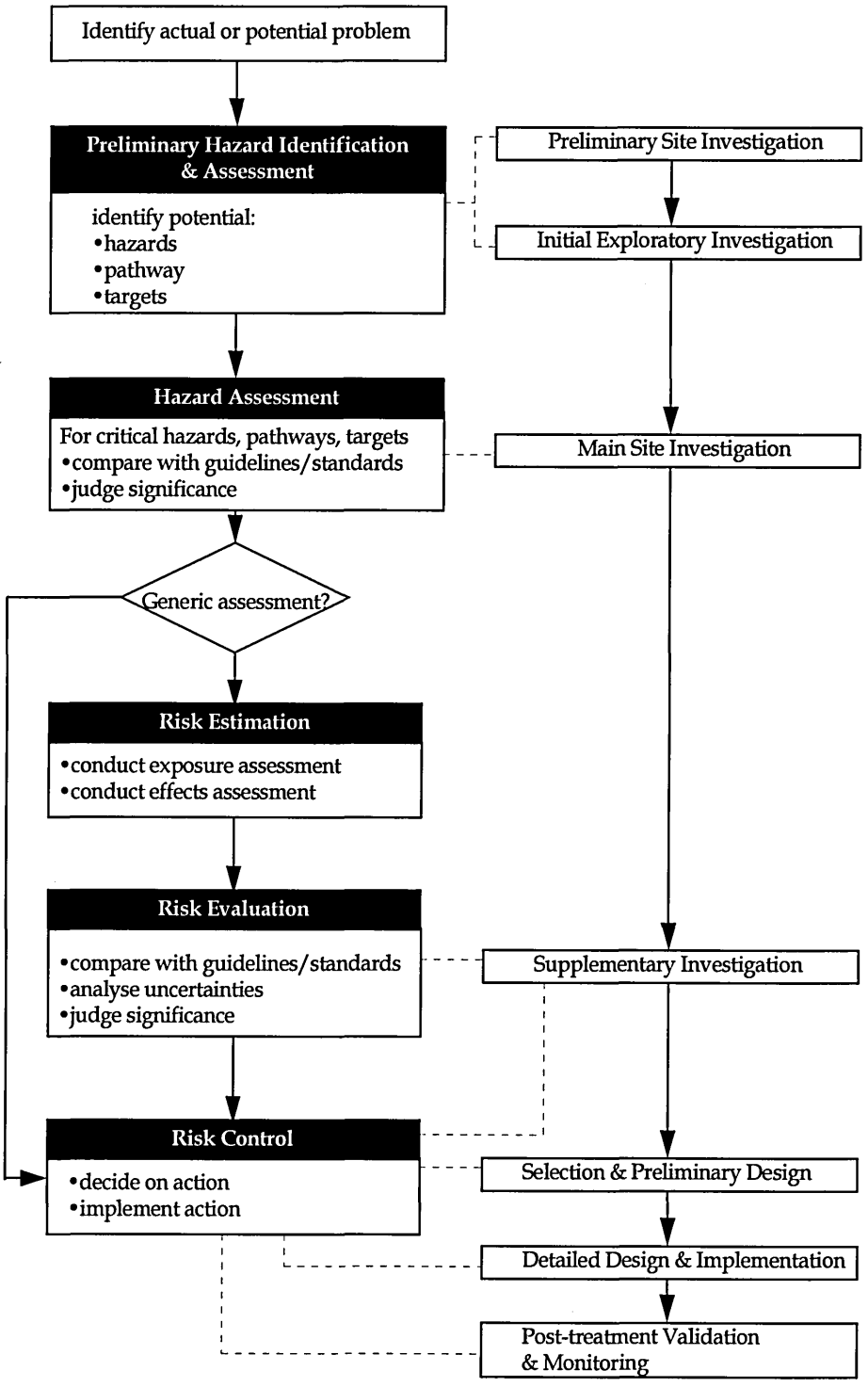
Risk management procedures are operational in many different social contexts, for example, a doctor involved in assessing a patient's suitability for a heart transplant or a bank manager assessing customers credit worthiness in relation to a loan application.

Risk management in a contaminated land context incorporates a two-stage process, *risk assessment* and *risk reduction.* Risk assessment can be defined as "the structured gathering of information available about risks and the forming of a judgement about them"(HMSO, 1995:3) and enables significant risks to be identified in a cost-effective manner (Gerrard and Petts, 1998:2). Risk assessment comprises four main elements:-

- *hazard identification and assessment*
- *risk estimation*
- *risk evaluation*
- *risk control* (Harris and Herbert, 1994:8)

Risk assessment comprises the processes of hazard identification and assessment, risk estimation and risk evaluation. Risk reduction comprises risk evaluation and risk control (Herbert and Harris, 1994:8).

Figure 2 - The Process of Risk Management



Source WDA, 1993: 2.3.

Local authorities as part of their inspection strategies will need to undertake a similar risk assessment process in relation to a significant number of sites within their area. In many cases local authorities may have difficulties in undertaking a comprehensive risk assessment of potentially contaminated sites due to lack of resources and technical knowledge. At the time Part IIA was implemented very little was known about the potential number of sites likely to require a comprehensive risk assessment. The pilot study described in Chapter Five identified that there were potentially 125 sites in the Borough of Barnsley that would need detailed assessment. The pilot study highlighted that Barnsley MBC would require additional resources to implement Part IIA and that the process of identifying and remediating contaminated land in the Borough was likely to be in excess of ten years.

3.2.1 Definition of Risk

'Risk' is defined in the statutory guidance as:

> *"the 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.*
>
> (DETR, 2000a:Para A.9:70)

Risk can be determined using qualitative statements (e.g. high, medium, low), quantitative criteria or a mixture of both (Young Pollard, Crowcroft, 1997:11). These qualitative statements for measuring risk are based on subjective value judgements which may be affected by different political and social environments (Gerrard and Petts, 1998:3). Communication and consistency in measuring that risk therefore becomes much more difficult. The choice of which method used in order to determine any particular risk, will depend on the ability of those methods to identify and communicate given risks within given timescales and financial restraints.

> "*The process of risk assessment can be defined as simply 'an evaluation of the probability of harm' and in the context of contaminated land, is concerned with gathering and interpreting information on the characteristics of sources, pathways and receptor (target) at a specific site and understanding the uncertainties inherent to the ensuing assessment of risk*" (Young, Pollard and Crowcroft, 1997:10).

Guidance regarding unacceptable levels of risk to humans from seven contaminants was provided to local authorities and risk assessors nearly two years after the implementation of Part IIA. This was obviously an early barrier to the effective implementation of Part IIA as local authorities would be unlikely to feel confident about determining land as 'contaminated land' where there was uncertainty about 'acceptable' levels of risk.

3.3 HAZARD[4] IDENTIFICATION

According to the Statutory Guidance, the first stage in identifying contaminated land is the establishment of a *pollutant linkage* (DETR, 2000a:para A.9). Within the risk management framework shown in Figure 2, the process of establishing a pollutant linkage is termed the hazard identification process.

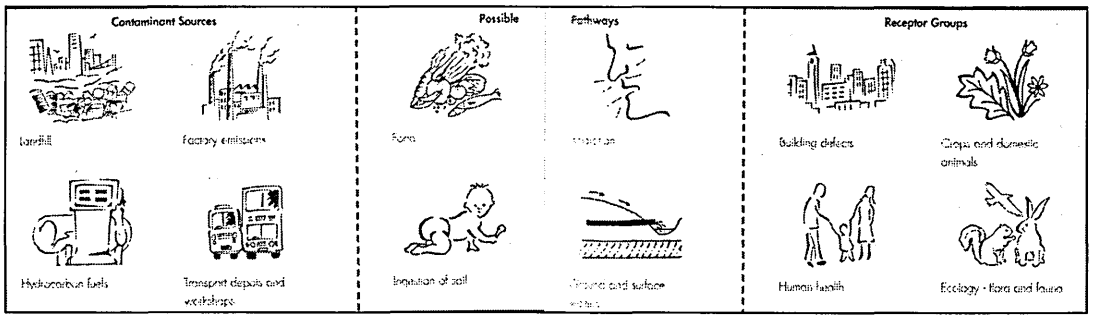
> *"Hazard identification is the systematic identification of the hazards that may be associated with a site or a group of sites, considering both the existing or proposed use of the site and its environmental setting"*
>
> (Petts, Cairney, Smith, 1998: 32).

3.3.1 Pollutant Linkages

A pollutant linkage is the identification of a contaminant (source), a pathway and a receptor (target). Examples of potential pollutant linkages are provided in Figure 3 below.

[4] "A hazard is a property or situation that has the potential to cause harm. Hazards may be chemical (e.g. the presence of a carcinogenic substance), biological (presence of a pathological bacterium) or physical (accumulation of an explosive or flammable gas). (Harris and Herbert, 1994: 4)

Figure 3 Examples of Potential Pollutant Linkages



Source: Syms and Knight, 2000: 14&15

The statutory guidance provides the following definitions:

Contaminant – "*is a substance which is in, on or under the land and which has the potential to cause harm or to cause pollution of controlled waters*". (DETR, 2000a:para A.12:)

Pathway – *"is one or more routes or means by, or through, which a receptor:*

(a) is being exposed to, or affected by, a contaminant, or

(b) could be so exposed or affected". (DETR, 2000a:para A.14:)

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 2 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." (DETR, 2000a:para A.13:)

Table 2 Receptor Groups

TYPE OF RECEPTOR
Human beings
Any ecological system, or living organism forming part of such a system, within a location which is: • an area notified as an area of special scientific interest under section 28 of the Wildlife and Countryside Act 1981; • any land declared a national nature reserve under section 35 of that Act; • any area designated as a marine nature reserve under section 36 of that Act; • an area of special protection for birds, established under section 3 of that Act; • 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); • any candidate Special Areas of Conservation or potential Special Protection Areas given equivalent protection; • any habitat or site afforded policy protection under paragraph 13 of Planning Policy Guidance Note 9 (PPG9) on nature conservation (i.e. candidate Special Areas of Conservation, potential Special Protection Areas and listed Ramsar sites); or • any nature reserve established under section 21 of the National Parks and Access to the Countryside Act 1949.
Property in the form of: • crops, including timber; • produce grown domestically, or on allotments, for consumption; • livestock; • other owned or domesticated animals; • wild animals which are the subject of shooting or fishing rights.
Property in the form of buildings. • 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.

Source: DETR, 2000a:Table A:73

A local authority has to be able to establish that there is a plausible pollutant linkage. Land cannot be identified as contaminated land unless all three elements are established.

The statutory guidance states that local authorities undertaking their inspection duties:

> *"should take a strategic approach to the identification of land which merits detailed individual inspection. This approach should:*
>
> *(a) be rational, ordered and efficient;*
>
> *(b) be proportionate to the seriousness of any actual or potential risk;*
>
> *(c) seek to ensure that the most pressing and serious problems are located first;*
>
> *(d) ensure that resources are concentrated on investigating in areas where the authority is most likely to identify contaminated land; and*
>
> *(e) ensure that the local authority efficiently identifies requirements for the detailed inspection of particular areas of land."*

(DETR, 2000a:para B.9:79)

It is interesting to note that the two case study areas discussed in chapter eight were both investigated prior to an inspection strategy been adopted. Had the Council not become aware of the risk potential by third party site investigations it is likely that the site at Totley may not have been investigated for several years and the Manor area would never have been investigated. This is due to the fact that Totley is a 'leafy suburb' not known for its past industrial heritage and there are no historic records of any landfilling or contaminative industries in the Manor area. This highlights the fact that even with a robust prioritisation method and a well resourced local authority may not identify all sites that are capable of causing significant harm.

3.3.2 Assessing Pollutant Linkages on an 'Area Wide' Scale

In development situations the potential for harm only needs to be assessed for a single site. Part IIA requires the identification of the potential for harm on an area wide scale. Local authorities will therefore be required to identify a method of assessing available historical information about land use and assessing the potential risks based on current land use. Identifying sites on such an area wide scale will require a local authority to develop a ranking system so that sites can be prioritised. This ranking system may involve qualitative statements of high, medium or low risk according to past use. The limitations of using the qualitative method are that it is subjective and different assessors may have different opinions as to the potential for risk. In contrast, a quantitative system may be adopted which assigns numerical scores to individual pollutant linkages. A number of different software packages and methods have now been developed for prioritising land for further investigation which are described later in this Chapter.

> *"The use of a risk assessment strategy should enable local authorities "to progressively better define the relevant...pollutant linkages until a point is reached at which confident decisions can be made on the most appropriate response to risk assessment findings"*
>
> (Harris, March 1999:3).

In addition, the hazard identification exercise is used to characterise sites in terms of past use and try to identify potential contaminants on sites. The difficulty of this task cannot be underestimated and a large amount of

information will need to be analysed and recorded so that sites can be prioritised for further investigation. The problem for local authorities is that all the required information is unlikely to be available. For example, it may have been lost due to poor administration or thrown away as it was no longer seen to be relevant by the user, etc. Evidence of this type of situation was identified as part of the Barnsley Collaboration (See Chapter Six). Where information exists it is quite often difficult to interpret. The knowledge of individual council officers relating to sites that may be contaminated is also being lost through retirement.

3.3.3 Desk Study and Site Reconnaissance

The initial search by local authorities may reveal *x* number of sites that have a possible significant pollutant linkage, which then requires further desk-study work to establish the plausibility of each pollutant linkage. The local authority will be able to gather more information about sites it suspects to be high risk, and by undertaking further desk study work and site reconnaissance develop a 'conceptual model' about each site. The conceptual model provides information about each pollutant linkage identified and should form the basis of further investigation. The conceptual model may then be refined on the basis of site investigation data.

The second part of the hazard identification stage in relation to Part IIA is to establish whether a pollutant linkage is a *significant* pollutant linkage. The significance of a potential pollutant linkage will require local authorities to gather additional data about a site. The local authority might be required to undertake a more detailed desk study, site reconnaissance and undertake limited soil sampling. The amount of additional information will depend to a large extent on the data used as part of the prioritisation methodology used by different local authorities. Table 3 provides a guide to the sort of information that local authority assessors will be trying to identify.

Table 3 Example of Site based information that will be Required by Local Authorities

Item of Information	*Examples*
Site layout (as built)	Plant components, building structures, drainage systems, process areas, storage areas, energy supply plant, effluent supply plant, and areas, maintenance facilities, laboratory facilities, site services
Design/construction modifications	Site layout, process train, materials
Nature/quantities of materials handled on the site	Feedstocks, intermediates, products, wastes, reagents, maintenance materials
Nature of the surrounding land use	Residential, hospitals, schools, nurseries, commercial, industrial, agriculture/horticulture, surface/groundwater resources, general ecology, ecologically valuable habitats
Physical Features	Present and past topography, propensity for flooding
Previous history	Industrial use, incidence of major accidents (fires, spillages, leaks)
Nature of building fabric and structural condition of plant/buildings	Modern plants are generally, but not always, less likely to have caused contamination than their order counterparts*
Geology/hydrogeology	Superficial and drift geology, present status of surface and groundwater bodies

It is probable that, in circumstances where a large amount of information is exists in order to undertake the early stages of prioritisation that the requirement for further desk study work will be negated. However, in situations where only historical mapping data has been used to prioritise sites for further investigation, a considerable amount of additional desk study will be required to prove the presence, or otherwise, of a significant pollutant linkage.

> "*The desk study includes a review of historical mapping, geological mapping, planning records, local library archives, business directories etc. in order to build up a conceptual model of the environmental circumstances a site and the potential contaminative past activities that have taken place on the site*" (Nathanail, 1997:1-2).

Resource constraints and other regulatory duties may restrict the ability of local authorities to undertake site reconnaissance at all sites and is likely to be undertaken only on those sites which can be categorised as medium or high risk or reach a certain points score. Information from the desk study should be used as a guide for site reconnaissance. Nathanail (1997) suggests that indicators of potential contamination could include stained soil, distressed vegetation, and leaking tanks. In addition he suggests interviews with local residents and former employees and an inspection of the surrounding area should be made along with a photographic record (Nathanail, 1997:2 Table 4 provides a summary of site reconnaissance activities. There may be

implications for local authorities that do not have sufficient resources to enable staff to undertake such an inspection.

Table 4 Site Reconnaissance Requirements

- Note any obvious immediate hazards to public health or safety (including trespassers) or the environment
- Note the condition of any fences etc. and any other factors affecting the security of the site
- Note any areas of discoloured soil, polluted water, distressed vegetation or significant odours
- Confirm as far as possible the location of buildings, roads, fences etc. and any deviations from those shown on the available plans
- Note the location and condition of any remaining buildings, structures, tanks etc.
- Record the presence, location and condition of any surface deposits and made ground, and any signs of settlement, subsidence or disturbed ground
- Determine the depth of any standing water, and the direction and rate of flow of water in any rivers, streams or canals
- Note any evidence of gas production or underground combustion
- Confirm the location of sewers etc.
- Note the location of services including telephones, water and electricity, that might be required or damaged during site investigation
- Note/confirm the uses of neighbouring land and, in particular, any activities that may have led to contamination of the site under investigation
- Note/confirm the position of any outfalls to surface water and the nature/condition of any discharges
- Look for any evidence of seepages through river or canal banks etc.
- Locate and note the condition of any boreholes etc. remaining from previous investigations
- Note where access can be gained to the site for site investigation equipment, waste disposal vehicles etc.
- Locate areas suitable for use during investigation for depots, offices, laboratories, sample storage, etc.
- Use suitable portable instrumentation to determine the presence, and possible concentrations of hazardous gases
- Limited sampling of surface deposits, surface waters etc.
- Making a photographic record of general site conditions and layout, and of any individual important features
- Liaise with present and former employees and local residents where appropriate to try and establish production methods, history etc.*

Source: CIRIA, Vol 111:1995 17 & *Nathanail 1997:2

Where a site is still occupied, local authorities have powers of entry under S.108 of the Environmental Protection Act 1990, but the statutory guidance stresses that voluntary co-operation should be encouraged (DETR, 2000a:para 27:11). Therefore, local authorities will need to communicate effectively the purpose of any site reconnaissance and further investigation work) with the present owner/occupier. The whole process of identifying who the relevant persons are that needs to be engaged in this process is time extremely time consuming, an example of which is highlighted in Chapter 8.

The site reconnaissance may not provide any further evidence of the possibility that a significant pollutant linkage exists. Unlike certain other environmental problems, land contamination cannot always be identified upon visual

inspection. Given the balance of probabilities, the local authority needs to decide whether an intrusive investigation should be undertaken in order to determine the presence and nature of potential pollutant linkages. It is likely that decisions regarding whether a site should be investigated will differ between local authorities.

3.4 HAZARD ASSESSMENT

The hazard assessment exercise aims to identify the possibility that a significant pollutant linkage exists and in relation to Part IIA meets the definition of contaminated land.

> *"Hazard assessment does not produce a quantified estimate of site specific risks; rather it provides for judgement about risk through the comparison of site-specific data with appropriate national or international standards or guidelines"*
> (Petts *et al*, 1997:33).

In the absence of any existing site investigation data about a particular site a local authority will need to undertake a limited amount of soil sampling and have the samples assessed for potential contaminants of concern. (A more detailed investigation would follow in circumstances where potential for significant harm was identified). The amount of information that will be required by local authorities before undertaking a limited investigation may differ according to the nature of suspected contamination and allocated budgets.

The statutory guidance states that:

> *"The authority should authorise an intrusive investigation only where it considers it likely (rather than only "reasonably possible") that a contaminant is actually present and that, given the current use of the land a receptor is present or likely to be present."*
> (DETR, 2000a:4)

Whether a local authority decides to undertake an intrusive investigation will depend to a large extent upon the prioritisation model adopted. There are a number of prioritisation models on the market, the purpose of which is to provide local authorities with some defensibility. There are examples, discussed in chapter four, where the prioritisation model identifies a significant number of high risk sites. It is therefore conceivable that the decision about whether to investigate a site may be a 'short straw' exercise. In the authors opinion most local authorities will only investigate sites where there is

considerable certainty that contamination will be found and will not investigate those sites where there is only a 'likelihood' of finding contamination.

In order to establish the presence of contamination local authorities will have to undertake some form of site investigation. The primary objective of the site investigation is to enable the local authority to obtain sufficient information in order to decide whether or not the land appears to be contaminated (DETR, 2000:5). Prior to the site investigation, local authorities will have undertaken the preliminary hazard identification stage of the risk assessment and subsequently need to characterise the nature of that hazard using the hazard assessment process. A local authority will need to design a site investigation that seeks to confirm, or otherwise, pollutant linkages identified at the desk study phase.

3.4.1 Initial Soil Sampling Strategies

Local authorities do not need to fully characterise the nature of all pollutant linkages to determine land as contaminated land. Therefore, unlike a site investigation for redevelopment purposes or detailed risk assessment, a local authority may choose only to undertake a limited amount of soil sampling. A number of different sampling patterns exist for undertaking site investigations such as stratified, non-stratified and herringbone (DoE, 1994c, BSI, 2001 and EA, 2001). The choice of sampling method is dependent on the former use of the land and what is known about the contamination on site and the required confidence levels (CIRIA, 1995:49). Other factors such as communication of information to interested parties will also have an impact on the choice of sampling methodology.

Due to the fact that Part IIA relates to *current uses,* it is likely that in many cases the ability to effectively establish pollutant linkages is hampered by existing buildings and structures. Indeed, it is possible that such structures may also have a significant impact on possible remediation options.

In order to establish the potential for a significant pollutant linkage, soil samples will need to be taken at various depths, but will depend upon a number of factors, namely:

- *The mobility of contaminants*
- *Geology and hydrogeology*
- *Hazards posed by contamination*
- *Depth to natural ground underlying any made ground*

(CIRIA, 1995:49)

Sampling will be required for a range of contaminants in soil (see Table 5), groundwater, surface water and possible gas migration. It should be noted that is a significant lack of accepted guidance in the UK with respect to many on the contaminants identified in Table 5 (see para 3.3.3 below). The cost of soil analysis will also be a factor for local authorities with a limited budget. The typical cost of analysing a soil sample for the elements shown in Table 5, and two other determinands is in the region of £70 plus VAT[5]. If a soil sample requires specialised analysis the cost can rise considerably. Local authorities will therefore need to think carefully about the type of analysis they undertake.

Table 5 Standard Range of Contaminants for Sampling

Elements	Anions	Other Determinands
Cadmium	Chloride	PH
Lead	Sulphate	Phenols
Arsenic	Sulphide	toluene extractables
Chromium		cyclohexene extractables
Zinc		coal tars
Copper		mineral oils
Nickel		sulphur
Boron		polyaromatic hydrocarbons (PAHs)
Mercury		electrical conductivity
		BTEX (benzene, toluene, ethylbenzene, xylene)
		Total Hydrocarbons

Source CIRIA, 1995: 23

The comprehensiveness of any sampling strategy is likely to depend upon local authority resources. The local authority needs only to establish that one significant pollutant linkage exists to determine that contaminated land exists. A local authority may wish to gather as much evidence at this stage as possible, especially if the local authority is not the responsible person for undertaken the required remedial treatment actions. Local authorities can apply to DEFRA for Supplementary Credit Approval to undertake intrusive investigations, but the local authority would need to provide strong evidence suggesting that a pollutant linkage is likely to exist.

[5] Quotes from Alcontrol and Robertsons Laboratories Novemebr 2003

3.5 ESTABLISHING WHETHER LAND IS CONTAMINATED LAND (RISK ESTIMATION AND EVALUATION)

The definition of contaminated land introduces a 'significance' test. Land must be capable of causing *significant harm* to specified receptors. There is some technical guidance available to local authorities in carrying out their duties to establish whether land is *contaminated land* (see Section 3.5.3). However, it is questioned whether the guidance currently available is sufficient to enable local authorities to implement Part IIA effectively, due to the limited number of published soil guideline values, the limited land use scenarios considered and the fact that the guidance only relates to human health.

3.5.1 Is There Evidence of Significant Harm?

Table 6 shows those receptor groups to which Part IIA applies, and the required effects in order to establish that significant harm is being caused. Given the serious indicators of significant harm it is likely that any areas where such significant harm is being caused would already be known about and action already taken. Many of the local authority officers that participated in this research stated that they were already aware of the worst sites in their area. Such sites were either being dealt with using different legislation or would be dealt with when Part IIA was brought into force.

Table 6 Description of Significant Harm

	Type of Receptor	Description of harm to that type of receptor that is to be regarded as significant harm
1	Human beings	Death, disease, serious injury, genetic mutation, birth defects or the impairment of reproductive functions. 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. In this Chapter, this description of significant harm is referred to as a "human health effect".
2	Any ecological system, or living organism forming part of such a system, within a location which is: An area notified as an area of special scientific interest under section 28 of the Wildlife and Countryside Act 1981; any land declared a national nature reserve under section 35 of that Act; any area designated as a marine nature reserve under section 36 of that Act; an area of special protection for birds, established under section 3 of that Act; 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); any candidate Special Areas of Conservation or potential Special Protection Areas given equivalent protection; any habitat or site afforded policy protection under paragraph 13 of Planning Policy Guidance Note 9 (PPG9) on nature conservation (i.e. candidate Special Areas of Conservation, potential Special Protection Areas and listed Ramsar sites); or any nature reserve established under section 21 of the National Parks and Access to the Countryside Act 1949.	For any protected location: 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 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. In addition, in the case of a protected location, which is a European Site (or a candidate Special 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. In determining what constitutes such harm, the local authority should have regard to the advice of English Nature and to the requirements of the Conservation (Natural Habitats etc) Regulations 1994. In this Chapter, this description of significant harm is referred to as an "ecological system effect".
3	Property in the form of: Crops, including timber; Produce grown domestically, or on allotments, for consumption; Livestock; other owned or domesticated animals; wild animals, which are the subject of shooting or fishing rights.	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. 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. In this Chapter, this description of significant harm is referred to as an "animal or crop effect".
4	Property in the form of buildings. 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.	Structural failure, substantial damage or substantial interference with any right of occupation. 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. 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. In this Chapter, this description of significant harm is referred to as a "building effect".

Source: DETR, 2000a:Table A:73

3.5.2. Is There The Significant Possibility of Significant Harm?

Table 7, below shows the type of information that local authorities should have regard to in determining whether there is the *significant possibility of significant harm.*

Table 7 Significant Possibility of Significant Harm

	Descriptions Of Significant Harm (As Defined In Table A)	Conditions For There Being A Significant Possibility Of Significant Harm
1	Human health effects arising from the intake of a contaminant, or other direct bodily contact with a contaminant.	If the amount of the pollutant in the pollutant linkage in question: which a human receptor in that linkage might take in, or to which such a human might otherwise be exposed, as a result of the pathway in that linkage, would represent an unacceptable intake or direct bodily contact, assessed on the basis of relevant information on the toxicological properties of that pollutant. Such an assessment should take into account: 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; the relative contribution of the pollutant linkage in question to the likely aggregate intake of, or exposure to, the relevant substance or substances; and the duration of intake or exposure resulting from the pollutant linkage in question. 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. Toxicological properties should be taken to include carcinogenic, mutagenic, teratogenic, pathogenic, endocrine-disrupting and other similar properties.
2	All other human health effects (particularly by way of explosion or fire).	If the probability, or frequency, of occurrence of significant harm of that description is unacceptable, assessed on the basis of relevant information concerning: that type of pollutant linkage, or that type of significant harm arising from other causes. In making such an assessment, the local authority should take into account the levels of risk which have been judged unacceptable in other similar contexts and should give particular weight to cases where the pollutant linkage might cause significant harm which: would be irreversible or incapable of being treated; would affect a substantial number of people; would result from a single incident such as a fire or an explosion; or would be likely to result from a short-term (that is, less than 24-hour) exposure to the pollutant.
3	All ecological system effects.	If either: significant harm of that description is more likely than not to result from the pollutant linkage in question; or there is a reasonable possibility of significant harm of that description being caused, and if that harm were to occur, it would result in such a degree of damage to features of special interest at the location in question that they would be beyond any practicable possibility of restoration. Any assessment made for these purposes should take into account relevant information for that type of pollutant linkage, particularly in relation to the ecotoxicological effects of the pollutant.
4	All animal and crop effects.	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.
5	All building effects	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.

Source: DETR, 2000a: Table B:

The term *significant possibility of significant harm* requires a probabilistic assessment of whether *significant harm* is likely given the current use of a site. Local authorities have now been provided with a large amount of procedural guidance regarding the determination process. There are a number of 'gaps' in current guidance and technical information, such as the limited number of soil guideline values and the number of land uses considered. The decision whether land actually meets the definition of contaminated land in many cases will be extremely difficult and place local authorities in an uncomfortable position regarding potential legal challenges.

3.5.3 The Withdrawal of ICRCL 59/83

Prior to the introduction of Part IIA the method of assessing the extent to which land is contaminated had been by reference to guidance published by the Inter-Departmental Committee for the Environment (ICRCL). The ICRCL produced a series of Guidance Notes covering different types of industrial land (Harris, Denner, 1998:27) and created the document Guidance on the Assessment and Redevelopment of Contaminated Land (First published in 1983 and then revised in 1987). The ICRCL Guidance note on the redevelopment of contaminated land covered 19 contaminants for a limited number of different possible end uses (ICRCL, 59/83, 1987). The Guidance note suggested two levels of contamination when assessing the potential for harm, a *trigger level* and an *action level*. If a contaminant was below a given trigger level, it was suggested that the land could safely be developed without the requirement for remediation. If a contaminant was above an action level, then it was suggested that the site would need treatment before being developed. If a contaminant was between the trigger value and the action value (if one had been provided), then *professional judgement* was to be used in order to determine whether remediation was necessary (ICRCL, 59/83, 1987). ICRCL 59/83, 1987 was finally withdrawn by DEFRA on 20th December 2002 in Appendix 8.

3.5.4 Soil Guideline Values (SGVs)

The SGVs were developed in order to replace levels of contamination for different land uses developed by the Inter-Departmental Committee on the Redevelopment of Contaminated Land. In March 2002, DEFRA and the Environment Agency introduced the Contaminated Land Exposure Assessment Model and associated Soil Guideline Values and Toxicological data. These documents provide local authorities and others with a method of determining risks relating to human health for three standard land uses, houses (with and without gardens), allotments and commercial industrial premises.

Soil Guideline Values have been developed using the CLEA framework for determining appropriate levels of contamination in soil for each of the three standard land uses. Contaminants that are thought not to have any observable

health effects below a certain level are known as threshold contaminants. Where there is uncertainty about the potential health effects of a contaminant this is known as a non threshold contaminant. (DEFRA, 2002a:17). CLR 7 states that for "non-threshold contaminants, exposure should be kept to a level as low as reasonably possible" (DEFRA, 2002a:17)

At the present time Soil Guideline Values (SGVs) have been developed for arsenic, cadmium, chromium, lead, nickel, selenium and inorganic mercury. Interestingly in CLR 7 a further three soil guideline values were due to be published (Benzo[a]pyrene, inorganic cyanide and phenol). At the time of completing this thesis (December, 2003) there is still some debate about the choice of SGV with respect to these contaminants (Discussion with Alwyn Hart, Environment Agency, October 2003).

Risk assessors may be able to derive their own site specific value for a contaminant based on available toxicological data and using the CLEA algorithms published in CLR 10. (DEFRA, 2002d). This task is likely to have a significant impact on local authority resources. As Braithwaite stated in the Environmental Health Journal in April 2003:

> *"...so if you want to do-it-yourself, a PhD in human toxicology and a few months on the internet are desirable. Even so, the chances of any two "experts" arriving at the same conclusion in any one instance must be pretty remote."*
> (Braithwaite, 2003a)

Local authorities may be reluctant to rely upon a site specific SGV where one is not already available as they may find themselves having to reassess a site in the light of a future SGV published by the government. This situation is highlighted in the *Manor Case Study* presented in Chapter Eight.

The limited number of published SGVs is likely to be problematic for local authorities faced with the prospect of determining land as *contaminated land*. There are significant financial implications in relation to dealing with contaminated land and local authorities will delay taking regulatory action on sites where they are not sufficiently confident that the results of a risk assessment will not be challenged.

It has been suggested (questions to delegates at CLEA training course held at Wilmslow July 2003a) that the SGVs for some contaminants are too conservative, due to the fact that in many areas of the UK 'natural' levels of contamination are much greater. This is the case, for example, with arsenic in many urban areas such as Hull and Sheffield (BGS, 2002).

Other uncertainties for local authorities involve the use of bioaccessibility testing on certain contaminants (arsenic and lead). These tests are undertaken in the laboratory and mimic the function of the stomach and intestine by breaking down ingested contaminants and estimating the proportion that could be absorbed in the human body. The proportion of contaminant that may be accessible to the human receptor may then be factored in to the risk assessment. At the present time there is no standard laboratory test for bioavailability in the UK and there are only a handful of laboratories offering the test. The Bioavailability Research Group of Europe (BARGE) is currently developing a standardised method for assessing bioavailability from contamination in soil. However, it is likely to be many years before such tests gain suitable accreditation in the UK. At a risk assessment training Course hosted by the Environment Agency it was stated that:

> *"at the present time the use of bioaccessibility tests has not been fully endorsed in the UK although it may be acceptable in certain circumstances"* (Environment Agency, 2003c).

It was also suggested that such tests may be appropriate where the levels of contaminants are only marginally above the published SGVs (Environment Agency, 2003c). The use of bioavailability has significant implications, especially in marginal cases and their use will in some circumstances save hundreds of thousands in remediation costs. More resources from DEFRA and/or the Environment Agency would help speed up the process of devising an accepted standard.

At the present time it is likely that local authorities will avoid using bioavailability testing as the reliability and validity of those tests may be questioned should a determination notice be challenged. Whether bioavailability tests will be used by local authorities in deciding whether land is contaminated land is likely to be some way off given the limited number of sites determined to date.

3.5.5 Other Assessment Criteria

Where a soil guideline value has not been developed in the UK for a particular contaminant, there may be circumstances when it could be beneficial to use values derived in other countries. Different countries have developed or adopted guidelines (advisory) or standards (mandatory), which define acceptable levels in soils for individual contaminants (POST, 1993:20). Many of these values have been developed specifically for the country where they were developed and are not always readily transferable from one country to another. Indeed, to do so in many cases may lead to the overestimation or underestimation of actual risk posed by any particular site.

The Netherlands have adopted a flexible approach known as the 'Intervention' system (Post, 1993:24). This system has just two sets of values. A 'Reference Value' which takes account of the composition of the soil and an 'Intervention Value' which takes account of both human health risks and ecological risks. If intervention levels are exceeded, then treatment of a site will be considered necessary, but its urgency will reflect the risk that the contaminants actually pose at the site. The criteria used to determine levels of risk are not always applicable to the UK and therefore some allowance normally need to be made by risk assessors. Other guidelines and standards that are often referred to in the UK include the:

- *Australian and New Zealand guidelines for the assessment and management of contaminated sites*
- *USEPA SSL*
- *Interim Canadian Environmental Quality Criteria for Contaminated Sites*
- *World Health Organisation*

Source: EA, July 2003c

In circumstances where a soil guideline value is not available for a contaminant in the UK for a specific land use then it may be appropriate to adopt a value adopted by another country or organisation. Where guidelines have been published in the above countries or organisations, they may have been derived for a specific reason, taking into account soil conditions, proximity of surface or groundwater and/or the behavioural characteristics of receptor groups. Local

authorities and others involved in the assessment of contaminated land therefore need to take account of these differences when trying to apply them in the UK. When using other risk assessment criteria there is often a significant amount of subjectivity in choosing the assessment criteria and as such may not always be publicly defencible.

3.5.6 Deriving Site-Specific Risk Assessment Criteria

Where a site does not meet the standard land use criteria set out in CLEA or there is a contaminant where a soil guideline value needs to be derived. It will be necessary to undertake a site-specific risk assessment or detailed quantitative risk assessment (DQRA). The DQRA enables the risk assessor to input more detailed information about a site in order to develop the contaminant exposure model. The conceptual exposure model used in CLEA is based on three elements 'land-use', 'fate and transport' and 'contaminant toxicology' (DEFRA:2002c:12)

> *"Traditional risk assessments are said to be 'deterministic', and are reliant upon the use of 'reasonable worst case' input parameters to produce a single (point) estimate of risk....it is ideal for providing a rapid assessment of whether the site is likely to require any remedial action. A site that does not present a significant health risk under a conservative, deterministic assessment need not be investigated further".*
> (URS Dames and Moore Dec 2000)

The SNIFFER Framework (SNIFFER, 1999 and 2003) described in the second case study of Chapter 8 is deterministic. The CLEA model is *probabilistic,* which means that instead of estimating acceptable exposure for a single point (e.g. a typical individual) a range of potential exposure estimates are assumed. CLEA uses Monte Carlo analysis to produce distributions of risk, reflecting uncertainty and/or variability in order to estimate the exposure to a given percentile of the population (e.g. 95^{th} percentile). The computation of the probable risk requires professional judgement to be exercised in determining certain dose-response relationships. CLEA calculates human exposure via ten different exposure pathways. The *Contaminated Land Exposure Assessment* model (CLEA) recognises that guideline values vary as a function of soil pH, soil matter etc. reflecting the influence of such parameters on contaminant partitioning between soils and soil solution.

"The full quantification of risk can be expensive, time consuming and problematic, and is unlikely to be justified except where dealing with complex, high risk and/or contentious problems. Certainly, the quantification of risk allows for site-specific action and remediation targets to be derived. Furthermore, the insight into the behaviour of contaminants gained as a result of a detailed assessment may be beneficial in the selection and evaluation of alternative remedial strategies"
(Petts et al, 1997:40).

The DQRA involves the processes of risk estimation and evaluation, the outcome of which will be a method for risk reduction and/or control.

3.5.7 Risk Estimation and Evaluation

Risk estimation is the process of estimating the probability that an unwanted "event" or outcome will occur under defined conditions (Harris, Herbert & Smith, 1995). Risk estimation involves detailed consideration of contaminants, pathways and receptors in order to establish:

- *the nature of the exposure of the receptor to the contaminant;*
- *the nature of the effects resulting from defined levels of exposure;*
- *the probability (expressed in either qualitative or quantitative terms) that adverse effects (harm) will occur at defined levels of exposure.*

(WDA, 1993:2.9)

Risk estimation in practice can be subject to uncertainty due to a lack of sufficient data on, for example:

- *the chemical form, behaviour and concentrations of contaminants reaching the target;*
- *the nature of the exposure (how much, how often and over what period);*
- *the effect of the exposure on that target (especially at low dose levels and in relation to carcinogenic hazards).*

(WDA, 1993:2.12)

Risk evaluation involves the consideration of:

- *"the qualitative or quantitative statements about risk derived from the risk estimation process;*
- *other site-specific factors which may affect the risks include the frequency of flooding and construction activity such as piling;*
- *the uncertainties in the risk estimates;*
- *the costs and benefits of taking action to control or reduce unacceptable risks;*
- *the social pressures for action;*
- *the significance and acceptability of the risks in relation to current and future land use."*

(Petts, Cairney, Smith, 1997:43)

The conclusions of the risk evaluation stage should provide information about the magnitude of risk and potential effects, any uncertainties in the assessment, details about the way in which altering the assumptions would alter the outcome

and a recommendation about risk reduction and control. (Harris, Herbert & Smith, 1995)

> *"A decision to take action requires that both the magnitude and potential consequences of the risks are taken into account. For example, some risks may be of a very low probability but the consequences could be significant (e.g. the risks of an explosion involving landfill gas which results in the death of individuals)."*

3.5.8 Making the Determination

Having gathered all the necessary information from the desk study, site reconnaissance and site investigation, the local authority will then have to determine whether the land should be determined as *contaminated land.* There are four possible options when making the determinations:

- *significant harm is being caused*
- *there is the significant possibility of significant harm*
- *significant pollution of controlled water is being caused; or*
- *there is the significant possibility of significant pollution of controlled waters.*

For example, where a local authority identifies levels of arsenic on a residential housing estate, which exceed the SGV of 20mg/kg, then it can determine the land as *contaminated land.*

Contaminated land can be determined on the identification of a single significant pollutant linkage. Where there are multiple pollutant linkages, local authorities must determine each pollutant linkage separately. It is not acceptable to simply issue a single determination for many pollutant linkages. In the view of the author this could potentially lead to ridiculous situations, for example, on a heavily contaminated site, a local authority may have to issue over 100 separate determinations due to the number of contaminants identified, number of potential receptors and identifiable pathways.

Having determined the land as contaminated land the local authority must inform all of the relevant parties of its decision.

The next stage of the risk management process will involve a more detailed site investigation, taking into account land-use characteristics, population, soil type,

behaviours etc. This may identify that, on the basis of probability, there isn't a significant possibility of significant harm. Alternatively, the more detailed risk assessment may confirm the findings of the initial assessment of risk, based on the generic values adopted in the SGVs. This being the case physical removal or treatment of the soil may be required in order to make the land suitable for its *current use.*

However, based on the author's experience there appears to be some confusion regarding the point at which a determination notice is served. It is suggested that the link between Soil Guideline Values (where they exist) and the Statutory Guidance is clarified in order to provide a consistent approach. At the present time it is unclear whether land should be determined when it is first found to exceed published guideline values or whether the local authority should wait until a detailed quantitative risk assessment (DQRA) has been undertaken. In many cases local authorities may wish to wait for the outcome of the DQRA in the 'hope' that the potential risk is not 'significant' which may make public relations easier.

3.6 REMEDIAL ACTIONS (RISK CONTROL)

Where the assessment indicates that the risks associated with contamination are unacceptably high, consideration must be given to risk control/reduction (WDA, 1993:2.14). The choice of action will depend on the nature of the pollutant linkage identified. However the local authority needs to be satisfied that any remediation action is 'practicable', 'effective' and 'durable' having regard to the likely cost and benefits that will be achieved. (DETR, 2000a: Para C.34-C.49). It is the stated intention of the government that, wherever possible, remediation should be undertaken on a voluntary basis, although local authorities do have powers to enforce remediation under S.78H of the Environmental Protection Act 1990.

The definition of remediation given in Section 78A includes assessment action (further detailed quantified risk assessment), and monitoring action as well as removing or treatment. Remediation is defined in section 78A(7) as meaning:

> *"(a) the doing of anything for the purpose of assessing the condition of-*
> *(i) the contaminated land in question;*

(ii) any controlled waters affected by that land; or
(iii) any land adjoining or adjacent to that land;

(b) the doing of any works, the carrying out of any operations or the taking of any steps in relation to any such land or waters for the purpose-

(i) of preventing or minimising, or remedying or mitigating the effects of, any significant harm, or any pollution of controlled waters, by reason of which the contaminated land is such land; or
(ii) of restoring the land or waters to their former state; or

(c) the making of subsequent inspections from time to time for the purpose of keeping under review the condition of the land or waters."

As part of the risk control process the relevant enforcement authority is required:

- *to establish who should bear responsibility for remediation*
- *to decide upon the necessary level of remediation either by agreement with those responsible, by taking enforcement action by serving a remediation notice or by undertaking the work themselves. Where enforcement action is undertaken by the local authority it needs to determine liabilities for the costs of the work*
- *to maintain a public register that records information about regulatory action.* (Based on DETR, 2000a).

The Statutory Guidance provides a framework describing the process that local authorities are required to follow when trying to establish the above information. It is likely that there will be many practical difficulties for local authorities in identifying the responsible parties and apportioning liability. Due to the historic nature of many contaminated sites, the appropriate person may no longer be in existence. Therefore if the current owner of the site meets one of the exclusion tests (see Section 3.6.1 below) the local authority will need to take responsibility for the required remediation. Such a scenario has significant resource implications.

3.6.1 Responsibility for Remediation

The Part IIA framework provides a detailed account of potentially responsible parties for remediation activities. There are many different scenarios that could apply to a site that has had a long history and a number of owners and operators. S.78F(2) states that ...

> "*any person, or any of the persons, who caused or knowingly permitted the substances, or any of the substances, by reason of which the contaminated land in question is such land to be in, on or under that land is an* ***appropriate person***." [Author's emphasis] (EPA, 1990)

A person can only be an *appropriate person* by virtue of the above section for the particular substances that they are known to have caused or permitted (S78F (3), EPA, 1990). The Statutory Guidance refers to this liability group as *Class A persons*. Where a site has had a number of previous owners and occupiers who may each have contributed to the contamination in the land, Part IIA provides local authorities with guidance about determining liability for each party (S78F (7) EPA 1990).

This is a potentially onerous task for local authorities who may find themselves in lengthy legal arguments in order to establish the responsible parties and the proportion of liability that each should share. It has been suggested that:

> *"As time progresses, the liabilities attached to [hazardous] sites will become more difficult to establish and thus the application of the 'polluter pays' principle will become more difficult to achieve"*
> (Estates Gazette, 1995:69)

Chapter D of the statutory Guidance provides local authorities with a complex system on the exclusion from, and apportionment of, liability for remediation. The difficulty of the task faced by local authorities in identifying potentially responsible persons is highlighted in Paragraph D.7 of the statutory guidance:

> *"The history of other sites may be more complex. A succession of different occupiers or of different industries, or a variety of substances may all have contributed to the problems which have made the land "contaminated land" as defined for the purposes of Part IIA. Numerous separate remediation actions may be required, which may not correlate neatly with those who are to bear responsibility for the costs. The degree of responsibility for the state of the land may vary widely. Determining liability for the cost of each remediation action can be correspondingly complex"*
> (DETR, 200a: Para D.7:104)

In addition to the difficulties faced in identifying responsible parties, local authorities then have to determine whether any of the following six exclusion tests apply:

Test 1- *Excluded activities*. Examples are the provision of financial assistance, the provision of insurance, consignment of waste under contract and the provision of technical advice

Test 2- *Payments Made for Remediation*. This test excludes from liability those who have already in effect met their responsibilities.

Test 3 - *Sold with Information.* This test excludes from liability 'knowing permitters' that caused the pollution who disposed of land to another member of the liability group with knowledge about the state of the land.

Test 4 - *Changes to Substances.* This test excludes from liability members of a liability group that caused the presence of a substance in the land which has only led to the creation of a significant pollutant linkage due to its interaction with another substance introduced by another person.

Test 5 - *Escaped Substances.* This test excludes members from liability where land has become contaminated as a result of the escape of substances from other land, where it can be shown that another member of the liability group was responsible for that escape.

Test 6 - *Introduction of Pathways or Receptors.* This test excludes members from liability due to the introduction of pathways or receptors by others.

There is a real possibility that local authorities will be faced with several legal challenges where landowners feel that they meet one or more of the above exclusion tests. There is also the potential that members of a liability group will claim hardship as described in Chapter E of the statutory guidance (DETR, 2000a). In such circumstances the responsibility for remediation will fall to the local authority. The fact that there may be legal challenges to local authority decisions will mean that a slow cautious approach is likely to be taken, in order that all information is gathered. A recent article in the Ends Magazine suggests that:

> "*The crunch time, when the first remediation notices are served is coming closer...There is a degree of nervousness on both sides. We have clients who, if they are served with a remediation notice, will challenge".*
> (Justine Thornton, Allen and Overy. *cf* ENDS, June 2003)

Where, after reasonable enquiry, the enforcing authority is unable to identify a *Class A person* then "the owner or occupier for the time being of the contaminated land in question is an appropriate person" (S.78F (4), EPA, 1990).The owner is defined by the EPA 1990 as:

> *"...a person (other than a mortgagee not in possession) who, whether in his own right or as trustee for any other person, is entitled to receive the rack rent of the land, or, where the land is not let at a rack rent, would be so entitled if it were so let;"*

The Statutory Guidance refers to the owner or occupier liability group as *Class B persons.* A class B person will only be responsible for remediation costs where no other Class A appropriate person is identified. Due to the historic nature of most contaminated sites it is considered likely that local authorities will

find it difficult and time consuming to trace and identify potential class A persons. In many circumstances the Class A persons may be that they are no longer in existence. In the authors opinion it is likely to be the landowner or recent owners that local authorities are most likely to pursue. The exclusion tests and hardship provisions make it probable in many cases that local authorities could become liable for the some, if not all of the costs of remediation.

There is no additional financial provision available from Central Government to assist local authorities that find themselves faced with a legal challenge. The lack of additional financial assistance may lead to the potential for local authorities to avoid taking regulatory action where it is concerned about a legal challenge. Tactically local authorities may find it easier to try and exclude all potentially liable parties and deal with any remediation using Supplementary Credit Approval.

3.6.2 Required Remediation

The statutory guidance states that:

> *"...wherever practicable, remediation should proceed by agreement than by formal action..."* (DETR, 2000a:para 6.6:31)

Where a site identified as contaminated land by a local authority has redevelopment potential the responsible person may wish to take the opportunity to turn the potential liability into an asset (See Section 2.5). There may of course be a number of barriers to undertaking effective remediation where the appropriate person is not the owner or occupier of a site and in circumstances where a site is still operational. Even in circumstances where there is no redevelopment potential the appropriate person may wish to avoid enforcement action. The advantages of taking voluntary action in such circumstances is:

- *the appropriate person is able to design the remediation strategy by agreement with the local authority*
- *the contaminated soil will be exempt from landfill tax*
- *other fiscal measures may be available (e.g. contaminated land tax credit)*
- *there is the potential to potentially obtain a profit from the sale of the land/redevelopment.*

Redevelopment is not an option in all cases. On such sites remediation may proceed on a voluntary basis or in circumstances where the local authority is unable to agree the required remediation then it may be necessary to serve a *remediation notice*.

Section 78E(1) requires a remediation notice to specify what each person who is an appropriate person to bear responsibility for remediation is to do by way of remediation and the timescale for that remediation. Where several people are appropriate persons, section 78E(3) requires the remediation notice to state the proportion of the remediation costs which each of them is to bear. Local authorities will therefore have to do a significant amount of historical research regarding land ownership prior to serving a remediation notice. This will inevitably delay progress with the implementation of Part IIA.

In deciding what remediation is required the enforcing authority is required to have regard to the cost which is likely to be involved S.78E (4) (a) and the seriousness of the harm, or pollution of controlled waters in question S.78E (4)(b). This cost-benefit analysis approach is likely to provide local authorities with some complicated dilemmas especially where there are potential health risks. For example, the case study in Chapter 8 at Manor Park, Sheffield, involved nearly 1000 properties and, had this area required remediation, could potentially have cost the local authority nearly £2million. A similar case has also been identified in Barking and Dagenham where the Council may have to issue more than 1000 determinations on a housing estate covered with ash from a local power station. (Hatchett, 2003:1).

In circumstances where a remediation notice is served by a local authority the appropriate person may appeal to a magistrate's court within twenty-one days S. 78L (1). The grounds for appeal relate to factors such as a material defect in the notice S78L (2)(a) and the remediation notice should have been served on somebody else S78L (5)(d).

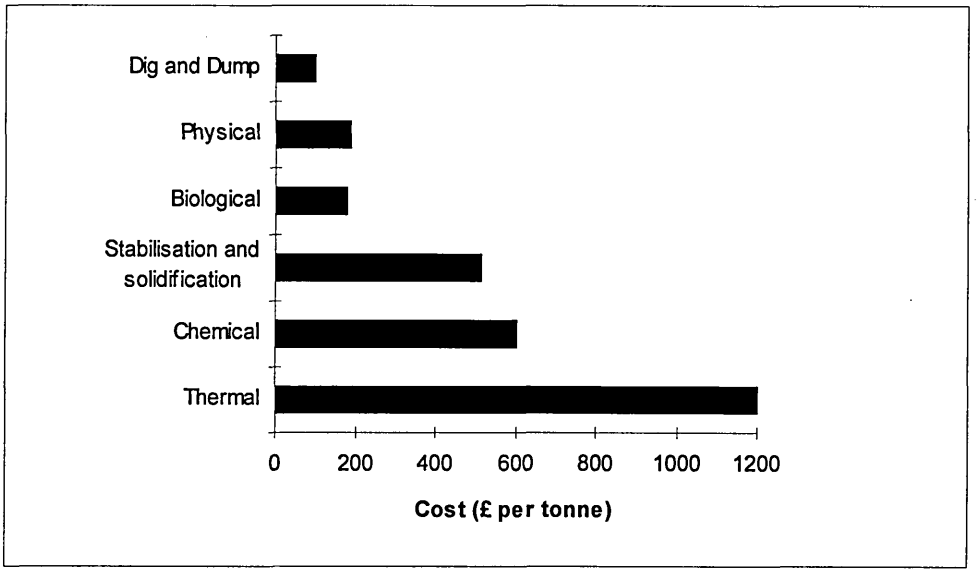
3.6.3 Standard of Remediation

The standard and method of remediation will differ according to the contamination and individual site characteristics. However, the method chosen needs to remove or reduce exposure to acceptable levels. The remediation will seek to 'break' the pollutant linkages identified. This may be achieved by removing the contamination, the pathway or the receptor. In all cases the proposed remediation method needs to be 'practical', effective' and 'durable' (DETR, 2000; Part 6: pg 96). The technical difficulties associated in achieving the required standard of remediation on land s that is occupied are highlighted in Chapter Eight. The fact that the land is occupied increases the time required to remediate land and also significantly increase the cost when compared to the remediation of an unoccupied development site.

3.6.4 Cost of Remediation

Technologies have moved from 'dig and dump', which is the simple moving of material from the development site to a licensed landfill, to more sophisticated methods such as biological, chemical and thermal treatments. The cost of carrying out the more sophisticated methods has historically been significantly greater than that of the 'dig and dump' option. (See Figure 4)

Figure 4 Costs of Remediating Contaminated Land



Source:RCEP 1995;Bardos, 1996; Syms 1997a;*cf* POST, 1998:30

The choice of remediation technique depends on a number of factors. These may include types of contaminant, time available to the landowner/developer prior to development, and the proposed end use. A number of these technologies may only be suitable for certain sites and, with the heterogeneous nature of land in the UK, each technology has to be chosen on a site-specific basis. Another factor is that many of the new techniques are not tried and tested and developers cannot afford to take the risks. This is currently being addressed by the Government through an initiative - CL:aire (Contaminated Land: Application in Real Environments) which aims to establish a network of independently owned test sites (see www.claire.co.uk). Whilst the choice of 'dig and dump' is likely to be more costly, it is quicker to administer and it deals with any perception of residual risk issues that may remain should other techniques be used.

In designing a remediation scheme for a site, there may be physical factors to consider, such as location, or live cables within the working area. This is especially true in relation to sites such as those described in Chapter eight which involve the remediation of established garden areas. The physical constraints can add significantly to the cost as can be seen in the Totley case study in Chapter Eight where the average cost of remediation was £20,000 per garden.

3.6.5 Cost Recovery

Where local authorities have identified contaminated land they are given powers under section 78N to undertake remediation works in the circumstances described in Box 4:

Box 4 Circumstances where Local Authorities may Undertake Remediation Works

- to prevent the occurrence of any serious harm, or serious pollution of controlled waters, of which there is imminent danger;
- where an appropriate person has entered into a written agreement with the enforcing authority for that authority to undertake the necessary remediation and has agreed to pay the costs;
- where a person on whom the enforcing authority serves a remediation notice fails to comply with any of the requirements of the notice;
- where the enforcing authority is precluded from including something by way of remediation in a remediation notice;
- where the enforcing authority undertakes the necessary remediation and it would decide,
- not to seek to recover any of the costs incurred; or
- to seek so to recover only a portion of that cost;
- where the enforcing authority has been unable to identify any appropriate person to undertake the required remediation.

(Source: EPA 1990, S.78N)

In addition section 78P (2) states that:

> *"when deciding whether to recover any of its costs in undertaking remediation work carried out under Section 78N the enforcing authority should have regard to:*
>
> *(a) to any hardship which the recovery may cause to the person from whom the cost is recoverable; and*
> *(b) to any guidance issued by the Secretary of State for the purposes of this subsection."*

In circumstances where local authorities have managed to identify appropriate persons they may find themselves with companies or homeowners claiming hardship. Therefore local authorities would have to pay for all or part of the cost of the remediation. The costs of remediation can be considerable as described in Section 3.6.3 and identified in the second case study in Chapter Eight.

3.6.6 The Public Register

Local authorities are required by Section 78R to maintain a public register of regulatory action relating to contaminated land in its area. Unlike the S.143 registers proposed by the Environmental Protection Act 1990, this register will only contain information relating to regulatory action on land determined as contaminated land.

Local authorities are required to provide details in the public register relating to:

(a) remediation notices served by that authority;
(b) appeals against any such remediation notices;
(c) remediation statements or remediation declarations prepared and published under section 78H;
(d) appeals against charging notices served by that authority;
(e) notices that have effect of designating any land as a special site;
(g) notices given by or to the enforcing authority terminating the designation of any land as a special site;

(DETR, 2000a:150-154)

Available literature and findings from this research identify that there has been slow progress in relation to regulatory action using Part IIA. At the time of writing this thesis no remediation notices had been served and only a limited number of remediation statements have been published. It is possible that in most local authorities the public register may not contain a single entry for many years. This will especially be the case where potentially contaminated land has redevelopment potential and/or is remediated voluntarily – prior to any determination notice. However, local authorities will collate a significant amount of information regarding land in their area which will highlight areas of potential contamination. Any concerns regarding the potential for land contamination can then be highlighted as part of a separate land search.

3.7 SUMMARY AND KEY QUESTIONS

This chapter has described how the theory of risk management has been applied to the regulation of contaminated land and highlighted the practical difficulties likely to be faced by local authorities. The risk management process is applicable in relation to enforcement action taken under Part IIA and in development situations. At the present time there does not appear to be sufficient technical guidance available to regulators and consultants in order that confident conclusions can be made about the level of risk. The withdrawal of ICRCL Guidance and the limited number of Soil Guideline Values which only relate to a small number of land uses will make risk assessment more difficult for local authorities. The risk assessment process is likely to be delayed in cases where no guideline value has been adopted or potentially require sites to

be revisited at a later date if the 'wrong' criteria is adopted. It is suggested that this will be the case for both Part IIA sites and development sites.

In addition to the lack of SGVs, bioavailability testing may have significant implications on sites where the levels of contamination are elevated above the publish guideline value. At the present time bioavailability tests have not been publicly adopted by the Environment Agency as there is no accredited analytical test. The extent to which the lack of published guidance is affecting the implementation of Part IIA will be evaluated as part of this research.

Where the risk assessment provides little doubt that the site is contaminated, local authorities are required to undertake a potentially lengthy and time consuming identification process to identify who should bear the responsibility for remediation. Local authorities will want to identify all responsible persons before taking any action due to the potential for a legal challenge. There will be circumstances where no polluter can be identified or exclusion tests mean that the local authority will need to take on responsibility for remediation. This research attempts to provide an assessment of the time taken by local authorities to determine responsible persons.

It is government policy that where ever possible land should be remediated through the redevelopment process. There are incentives available to developers to assist in this process. It is possible that local authorities may in many circumstances delay taking any regulatory action under Part IIA where there is the potential for redevelopment. The extent to which the redevelopment process if affecting the regulation of contaminated land using Part IIA forms part of this research enquiry.

There are considerable technical difficulties in remediating contaminated land where the land is occupied. There may be difficulties with access, live services, topography and health and safety of residents. Such considerations can have a significant impact on overall costs. In addition there is little published guidance available regarding acceptable levels of clean cover in typical remediation scenarios. This research will look at the costs involved in remediating contaminated land identified as part of the Part IIA process.

Local authorities are required to keep a public register of remediation action on contaminated land. At the present time it appears that most local authorities in England do not have any information on their contaminated land remediation registers. Local authorities will collate a considerable amount of information (described in Chapter Four) relating to the past use of land in its area. The extent to which this information is made publicly available will be examined as part of this research.

The application of the risk assessment process is potentially very complex when applied in a regulatory context and is likely to require a considerable amount of information to be assessed by local authority staff charged with the task of implementing Part IIA. At the present time it is not clear how many sites will require further investigation by local authorities, but this is likely to vary considerably according to geographic location, amount of information available, resources and prioritisation method. The prioritisation methods and strategy requirements are discussed in greater detail in Chapter Four.

CHAPTER 4
THE STRATEGY, PRIORITISATION AND TARGETS

4.1 INTRODUCTION

Part IIA places the responsibility of identifying contaminated land and determining such land as contaminated land onto individual local authorities (s.78B). Part IIA provides a mechanism that requires local authorities to identify contaminated land in its area, and to ensure that where such land is identified it is made suitable for its current use. Section 78B(1) of the EPA 1990 requires that:

> *"Every local authority shall cause its area to be inspected from time to time for the purpose-*
>
> *"(a) of identifying contaminated land; and*
> *"(b) of enabling the authority to decide whether any such land is land which is required to be designated as a special site."*

In addition, Section 78B(2) requires each local authority to "act in accordance with any guidance issued for the purpose by the Secretary of State." However, due to considerable delays in producing the final version of the Statutory Guidance, preparations for the implementation of Part IIA by local authorities were also significantly affected (see Chapter 9).

This Chapter considers the requirement for each local authority to produce a strategy and assesses alternative methods for identifying contaminated land on an area wide basis. The chapter considers how land will be prioritised for further investigation and targets that have been set by different local authorities. The chapter also provides a brief consideration of how local authorities may communicate potential risk from contaminated land as part of their strategy.

4.2 THE REQUIREMENT FOR A STRATEGIC APPROACH

The Statutory Guidance placed local authorities under an obligation to produce a written strategy within 15 months (DETR, 2000a: para 3.2: pg 21). The Guidance requires:

> *"each local authority to identify, in a rational, ordered and efficient manner, the land that merits detailed individual inspection, identifying the most pressing and serious problems first, and concentrating resources on the areas where contaminated land is most likely to be found" (DETR, 2000a:para 3.3: 21).*

The ability of local authorities to meet this deadline will have been affected by existing resources and preparations prior to the implementation of Part IIA. Early research undertaken as part of this thesis identified a general lack of resources and preparedness. The Department for the Environment Transport and the Regions (DETR) issued a technical advice note for local authorities *Contaminated Land Inspection Strategies* (DETR, May 2001) in May 2001. That is only two months before local authorities were due to have published their inspection strategy. There are a number of procedural implications of adopting a new local strategy for individual local authorities, such as obtaining agreement from relevant committees and undertaking public consultation. It is not surprising that many local authorities failed to meet the statutory 15 month deadline (Environment Agency, 2002).

The purpose of the strategic approach was intended to enable each local authority to:

> *"identify, in a rational, ordered and efficient manner, the land which merits detailed individual inspection, ,identifying the most pressing and serious problems first and concentrating resources on the areas where contaminated land is most likely to be found"* (DETR 2000a: para 3.3: pg 21).

Individual strategies are likely to differ according to an area's industrial past, local authority resources, available information, existing data management and political will to implement the legislation. Pressure from various interest groups, for example developers and environmentalists, may also influence the strategy adopted by local authorities.

In developing the strategy, the Statutory Guidance requires local authorities to reflect local circumstances. Box 5. below shows what local authorities should consider when developing their strategies.

Box 5 Local Authority Strategic Considerations

(a)	any available evidence that significant harm or pollution of controlled waters is occurring;
(b)	the extent to which any receptor is likely to be found in any of the different parts of the authority's area;
(c)	the extent to which any of these receptors is likely to be exposed to a contaminant by, for example, geological and hydrogeological features of the area;
(d)	the extent to which information on land contamination is already available;
(e)	the history, scale and nature of industrial or other activities, which may have contaminated the land in the area;
(f)	the nature and timing of past development in different parts of its area;
(g)	the extent to which remedial action has been or is to be undertaken as part of recent or impending redevelopment, and
(h)	the extent to which other regulatory bodies are likely to be considering the possibility of harm being caused to particular receptors or the likelihood of any pollution of controlled waters

Source: DETR, 2000a:para B10:79

Empirical research undertaken as part of this thesis assesses the quality of information available to local authorities regarding the amount of contaminated land in their area and evaluates the extent to which this information may be used to determine contaminated land.

Paragraph B.15 of the Statutory Guidance includes details of what should be included within the strategy. These details are shown in Box 6 below.

Box 6 Details of Information to be Included in a Local Authority Strategy

(a)	description of particular characteristics of area and how that influences its approach;	
(b)	the authority's aims, objectives and priorities;	
(c)	appropriate timescales for inspection of different parts of its area, and	
(d)	arrangement and procedures for	
	(i)	considering land that it my have responsibilities for by virtue of its current or former ownership or occupation,
	(ii)	obtaining and evaluating information on actual harm, or pollution of controlled waters,
	(iii)	identifying receptors and assessing the possibility or likelihood that they are being, or could be, exposed to or affected by a contaminant,
	(iv)	obtaining and evaluating existing information on the possible presence of contaminants and their effects,
	(v)	liaison with, and responding to information from, other statutory bodies, including in particular, the Environment Agency, English Nature, and Ministry of Agriculture Fisheries & Food (MAFF),
	(vi)	liaison with, and responding to information from, the owners or occupiers of land, and other relevant interested parties,
	(vii)	responding to information or complaints from members of the public, businesses and voluntary organisations,
	(viii)	planning and reviewing a programme for inspecting particular areas of land,
	(ix)	carrying out detailed inspection of particular areas of land,
	(x)	reviewing and updating assumptions and information previously used to assess the need for detailed inspection of different areas, and managing new information, and
	(xi)	managing information obtained and held in the course of carrying out its inspection duties.'

Source :DETR, 2000a:80-81

Local authority strategies will vary according to the political priority placed on implementation of Part IIA. This in turn will have a significant impact on the revenue available to the local authority department responsible for the implementation of Part IIA. Timescales are likely to be set according to available resources and technical expertise. The available resources, targets, and procedures adopted by individual local authorities are assessed as part of this thesis.

4.3 AVAILABLE INFORMATION

The process of prioritising land for further investigation will require an iterative approach to be adopted. The first stage is likely to involve a search of historical Ordnance Survey maps, trade directories and then those sites placed in a 'high priority' category will require *desk study and site reconnaissance (or walk-over survey)*.

The rigour with which pollutant linkages are identified will depend on individual local authorities' existing information on land contamination, resources and their political will to implement Part IIA.

The process of prioritising land will require the local authority officer responsible for contaminated land reviewing a vast amount of information. Some authorities may have more data than others to consult, for example historic trade directories tend to relate to urban areas only. Table 8 shows possible sources of information.

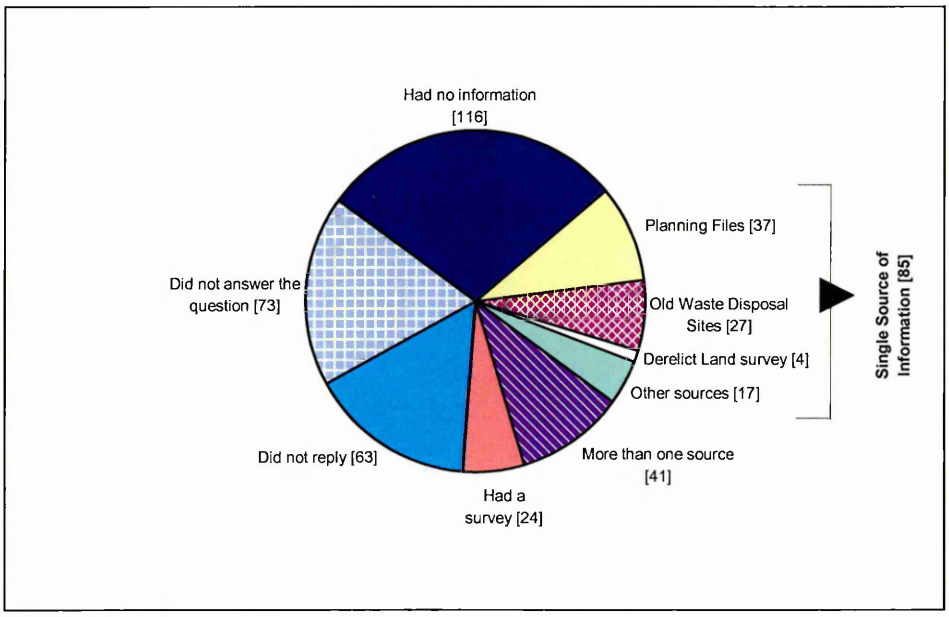
Table 8 Local Authority Information Sources

Source	Value	Limitations
Maps – Ordnance Survey	Wide coverage Historical time-frame Reasonable level of accuracy	Detail may be omitted or generalised Requires skilled interpretation For most recent site uses may be out of date
Maps – Geological Survey for planning purposes, soil survey and land research centre	Identify unstable ground, mining and infill areas	Restricted area coverage Soil maps too small scale
Maps - enclosure maps; property maps; tithe maps; estate maps; town plans	Specific to areas and can be provide site-specific details	No continuity over time
Directories - e.g. Kelly, post office, local city	Identify individual premises Historical uses - back to about 1830	Urban locations only Interpretations of specific trades may be difficult Street names may have changed
Waste Disposal Registers (Environment Agency)	Location of sites and types of waste deposited	Only since 1976 Licence may not correspond with actual disposal
Scrap Metal Registers (local authorities)	Registers of premises used for scrap metal storage	Since 1964 - only includes active sites
Consent registers - Discharge to Water	Records of consents for discharges to surface water and sewer	Only since 1976
Disposal of diseased animals (local authorities; MAFF and water companies)	Record sites where animals buried	
Disposal of sludge (Environment Agency)	Records sites for disposal of sludge	Only since 1989
Authorisations (Environment Agency)	Authorisation of prescribed processes Authorisations of processes controlled for air pollution	Only since 1991
Explosives storage (local authorities)	Register of premises on which explosive wastes are kept	
Radioactive Substances Registers (Environment Agency)	Premises regulated under Radioactive Substances Acts	Since 1960
Hazardous Substances (local authorities)	Record of consents issued to sites storing hazardous substances under Planning (Hazardous Substances) Act 1990	Since 1982 original registrations with Health and Safety Executive under Notification Regulations; refers to current active consents
Aerial and satellite photographs	Coverage of most of Britain since 1946 Good for determining boundaries of quarries, landfill etc.	Satellite imagery may not identify individual areas
Local archives, museums, societies	Good for information on local industries, processes etc.	Secondary source only to maps and directories

Source: Petts, Cairney, Smith, 1998:82-83

A survey undertaken in 1993 by Friends of the Earth showed that a large percentage (44%) of local authorities had no readily available information on land affected by the presence of contamination. (See Figure 5 below).

Figure 5 Local Authority Information on Contaminated Land in 1993



Source POST, 1993:29

Given the large number of local authorities that stated they had no readily available information, it was necessary as part of this research project to identify progress at the implementation stage. The Yorkshire and Humberside Pollution Advisory Council (YAHPAC) group discussion held at an early stage of this research (see Chapter 9) suggested that some of the more urbanised and populated authorities potentially had more data to consult (such as trade directories and aerial photographs) than their rural counterparts. However, the amount and quality of this data had not been assessed by any of the group which suggested at the time that local authorities were not undertaking a significant amount of preparatory work. This research will investigate the amount and quality of data available to local authorities before and after the implementation of Part IIA.

4.4 INFORMATION MANAGEMENT

The methods in which information is stored and held at the time of implementation will also have a significant impact on the time it takes a local authority to implement its strategy. Local authorities may store their information on paper or it may be available electronically. The information may be stored centrally or may be stored in a number of different departments situated in different locations of a local authority area. The types of information held and the method in which it is stored will need to be identified.

Geographical Information Systems (GIS) offer a suitable means of storing information relating to contamination (Kennedy *et al*, 1997; Simons, 1994). Such systems enable a significant amount of information about land use to be stored. Visual information is available showing, for example, polygons of potentially contaminated land, rivers and housing. In addition a database can run alongside the GIS and is 'geo-referenced' which enables the user to link easily between the database information and the GIS information. The database may store information about current use, site address, owners, historic land use etc. The only limitation on the amount of information stored on a GIS may be the size of the hard-drive and processor of the computer. GIS software may enable local authorities to prioritise contaminated land much more effectively than a paper based method due to the ability to map areas of potentially contaminated land and view them in relation to current land use.

There are a number of GIS systems on the market. From the authors experience and internet searches the two leading suppliers appear to be ESRI Arcview and Microsoft MapInfo (see www.mapinfo.com and www.esri.co.uk). There are also a number of auto-cad programs which enable some limited land use recording, but do not offer the same functionality. Local authorities are likely to have very different GIS strategies. Information gathered at an early stage of the collaboration with Barnsley MBC suggested that there were more than two GIS packages being operated by different departments in the same local authority. The use of different GIS software packages within the same local authority can cause problems because information is not always exchangeable.

The operation of a GIS system does require a certain degree of specialist knowledge and it is likely that some training may be required in order to enable the system to function correctly. The availability of GIS to individual local authorities and technical expertise to use such software will be investigated as part of this research.

The cost of a single user GIS license is approximately £1,300 (Quote from CDR Group, August 2003). There are additional costs likely to be incurred by local authorities in buying any additional computer hardware to support the GIS, and costs to purchase any digitised information and/or 'bolt-on' prioritisation package.

4.5 PRIORITISATION METHODS AND TARGETS

The UK Government did not introduce a standard methodology which local authorities could use to prioritise potentially contaminated land. Instead local authorities were able to develop their own method for prioritising contaminated land or 'buy-in' bespoke prioritisation software developed commercially. Methods of prioritising contaminated land may be based on similar principles, but may have different outcomes depending on the 'scoring' parameters adopted. There are prioritisation tools developed by other countries such as, *the Hazard Ranking System* (HRS) used to rank sites in the US, the *National Classification System* used by municipal authorities in Canada for prioritising federal sites and the New South Wales Environment Protection Agency ranking system for prioritising potentially contaminated sites for further investigation. (Petts, Cairney, Smith, 1998:234). There are now a number of different prioritisation methods that have been commercially developed and some by individual local authorities. A brief summary of some of the available prioritisation options is provided, although it is not the purpose of this thesis to assess individual prioritisation models in terms of functionality, cost, usability, advantages and disadvantages.

4.5.1 The Hazard Ranking System

The Hazard Ranking System (HRS) is a points scoring system used in the United States in order to prioritise land for further investigation (see Chapter 7). Sites which receive a score over 28.5 are placed on a national priorities list. The risks are then further assessed and where necessary land is remediated. The HRS is particularly sensitive to groundwater and higher scores are often achieved where there is a nearby groundwater abstraction point. Sites which do not achieve a score of 28.5 are placed on a separate list (CERCLIS). These sites will be kept under review should any of the pollutant linkages alter. The HRS is considered further in Chapter Seven along with an evaluation of its applicability to the UK.

No such formal ranking system exists in the UK for prioritising potentially contaminated land and local authorities may develop their own system or simply adapt existing systems. It is argued in Chapter seven that a method similar to the HRS could have been adapted for the UK situation in order to provide a consistent approach to prioritisation. The basis of prioritisation is a choice for individual local authorities, yet it will need to ensure that it identifies those sites which are most likely to be contaminated land. (DETR, 2000: Para B.9:79). Therefore it is possible that two different local authorities could have a similar significant pollutant linkage (e.g. a residential estate on a former tannery) but given a different order of priority.

4.5.2 Commercially Developed Prioritisation Tools

The prioritisation models generally adopt a points scoring system based on geographic coincidence between identified potential sources with pathways and receptors identified within a certain radius. Generally, the prioritisation models uses default values for different sources (e.g. 10 for Steel works and 2 for sewage works) different pathways and receptors. Most of the prioritisation tools place a score for the source, based on the list of potentially contaminative industries developed by the DoE in 1991. A similar point scoring system is used by the packages for pathways and for receptors. The number of pathways

and the number of potential receptors do differ slightly between models as does the final points score.

There are prioritisation packages offered by WS Atkins, British Geological Survey, AEA Technology and Conestoga-Rovers & Associates. The choice of package may depend upon whether information needs to be shared corporately and the type of GIS used, as this does have an impact on the overall cost of the prioritisation model. The cost of these packages range from approx £3500 - £7000 (based on quotes obtained by Sheffield City Council).

Some local authorities may choose not to purchase an off-the-shelf package and develop their own model. Information provided to YAHAPC indicated Salford Metropolitan Borough Council have adopted 'Flare', an environmental data management programme, for the purpose of storing site information and prioritisation. Flare has then been linked to MapInfo in order to show the site and draw necessary polygons etc. A methodology was created for Barnsley MBC prior to the implementation of Part IIA using a table that placed the industries listed in the DoE profiles into four categories of risk published by the National Federation of Housing Associations (NFHA, 1995:46). These industries were not given an individual score, but individual local authorities could potentially adopt this table as a starting point for prioritisation. (see Chapter Six).

4.5.3 Other Methods for Prioritising Potentially Contaminated Land

Table 9 shows Syms' Risk Based Classification of Land Uses and either the index of perceived risk or perceived risk category could be used to rank sites on a quantitative or qualitative basis. This table has been used by a number of local authorities (e.g. Bristol and Trafford MBC) as method of prioritising the potential for harm on the basis of historic land use.

Syms (1999) summarised thirty-nine of the industry profiles for the non-technical user and has produced a hazard ranking system based upon an index of perceived risk. Syms acknowledges that the ranking is a generalisation "which must be used in the context of the environmental sensitivity of the site and its surroundings" (Syms, 1999:11).

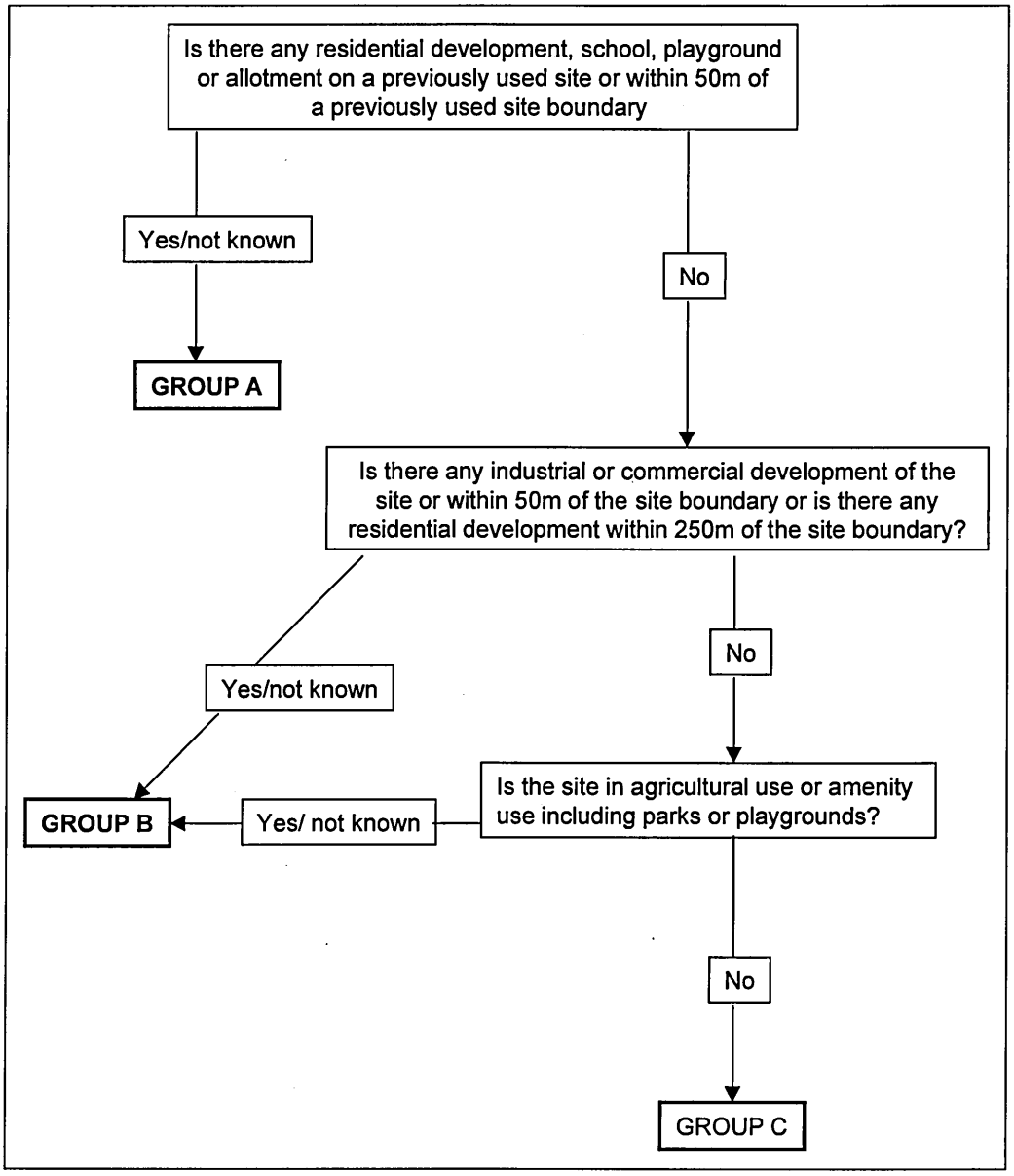
Table 9 A Potential Method for Prioritising Contaminated Sites

	Hazard Rank	*Land Use Classification*	*Index of Perceived Risk*	*Perceived Risk Category*
Class A	1	Asbestos manufacture and use	1.00	HIGH
	2	Organic and Inorganic chemicals production not included elsewhere	0.93	HIGH
	3	Radioactive materials processing and disposal	0.88	HIGH
	4	Gasworks, cokeworks, coal carbonisation and similar sites	0.85	HIGH
	5	Waste disposal sites,, including hazardous wastes, landfills, incinerators, sanitary depots, drum and tank cleaning, solvent recovery	0.85	HIGH
	6	Oil refining, petrochemicals production and storage	0.84	HIGH
	7	Manufacture of pesticides	0.83	HIGH
	8	Pharmaceutical industries, including cosmetics and toiletries	0.82	HIGH
	9	Fine chemicals, dyestuffs and pigments manufacturing	0.82	HIGH
Class B	10	Paint, varnishes and ink manufacture	0.79	HIGH
	11	Animal slaughtering and by-products, including soap, candle and bone works, detergent manufacture	0.78	HIGH
	12	Tanning and leatherworks	0.77	HIGH
	13	Metal smelting and refining, including furnaces and forges, electroplating, galvanising and anodising	0.74	HIGH
	14	Explosives industry, including fireworks manufacture	0.73	HIGH
	15	Iron and steel works	0.72	HIGH
	16	Scrap yards	0.68	HIGH
	17	Engineering (heavy and general)	0.66	MEDIUM
Class C	18	Rubber products and processing	0.65	MEDIUM
	19	Tar, bitumen, linoleum, vinyl and asphalt works	0.65	MEDIUM
	20	Concrete, ceramics, cement and plaster works	0.65	MEDIUM
	21	Mining and extractive industries	0.65	MEDIUM
	22	Electricity generating (excluding nuclear power stations)	0.64	MEDIUM
	23	Film and photographic processing	0.63	MEDIUM
	24	Manufacture of disinfectants	0.62	MEDIUM
	25	Paper and printing works, including newsprint (usually excludes 'high street' printers)	0.60	MEDIUM
	26	Glass manufacture	0.58	MEDIUM
	27	Fertiliser manufacture	0.58	MEDIUM
	28	Timber treatment works	0.58	MEDIUM
	29	Sewage treatment works	0.54	MEDIUM
	30	Garages, inc sale of automotive fuel, repairs of cars and bikes	0.53	MEDIUM
	31	Transport depots, road haulage, commercial vehicle fuelling, local authority yards and depots	0.53	MEDIUM
	32	Railway land, including yards and tracks	0.53	MEDIUM
	33	Electrical and electronics manufacture, inc. semi-conductor manufacturing plants	0.48	MEDIUM
	34	Textiles manufacture and dyeing	0.48	MEDIUM
	35	Laundries and dry cleaning (larger scale, not usually "high street")	0.48	MEDIUM
Class D	36	Plastic products manufacture, moulding and extrusion; building materials; fibre glass, fibre glass resins and products	0.48	MEDIUM
	37	Dockyards and wharves	0.48	MEDIUM
	38	Food processing, including brewing and malting, distilling of spirits	0.45	LOW
	39	Airports and similar	0.45	LOW

Source Syms, 1999:11

The thirty-nine land use categories identified by Syms are those which are "most likely to result in contamination of the ground at watercourses at, or adjacent to, the location of the activity" (Syms, 1999:10). The thirty-nine land use categories were divided into four classes, A to D. Class A strongly recommends an intrusive investigation and class D suggests that an intrusive investigation is merely optional. These classes are intended to guide valuers when a site investigation should be undertaken, but could easily be adapted by a local authority when prioritising land for inspection. The table has been criticised by Nathanail (1999) as potentially 'unhelpful' due to the risk scores associated with some of the previous uses.

Figure 6 DoE CLR 6 Part I Assessment



Source: Based on DoE, 1995, Figure 2

The DoE, Contaminated Land Research Report *Prioritisation and Categorisation Procedure for Sites which may be Contaminated* (DoE, 1995) provides a methodology for the preliminary assessment of sites which may require further investigation. Using this method any residential development, school, playground or allotment, on a previously used site or within 50m of a previously used site boundary would be placed in Group A. If a site did not meet the necessary criteria to be placed in group A then it could be classified as Group B or Group C, see Figure 6.

Group A sites would then be investigated further, followed by Group B and then Group C. The difficulty with this method is that without using some other method as well, "*most sites fall into 'Group A' and is therefore not very helpful*" (EHO – East Riding Council). The second phase of the CLR 6 prioritisation and categorisation procedure requires information obtained as a result of further investigation i.e. desk-study work, soil sampling etc.

4.5.4 Further Investigation And Remediation

Following the initial prioritisation it is likely that most local authorities will have sites that need further investigation. Within the strategy document local authorities will have provided details about the various stages of their investigation and priorities for further inspection. Details regarding further investigation should provide details about the various stages, e.g. site visit, intrusive sampling, communication, risk assessment and the remediation process. It is likely that much of the detail regarding further investigation will not be known until the initial prioritisation has been undertaken. It is therefore probable that most local authorities will make reference to acting in accordance with relevant published guidance rather than being specific. The Statutory Guidance provides a procedure and powers enabling further investigation and remediation to been undertaken using enforcement action if necessary. Local authorities are not provided with any specific timescales in which they need to undertake further action. Timescales and methods used for further investigation will be assessed as part of the research undertaken for this thesis. The need to undertake further investigation and/or remediation using the provisions in Part

IIA will also be affected by the amount of regeneration being undertaken in a local authority area.

4.6 THE IMPACTS OF THE REGENERATION PROCESS ON LOCAL AUTHORITY STRATEGIES

Chapter two has already highlighted that it is government policy that wherever possible land should be remediated as part of the development process. In 2001, 61% of new housing development in England was on brownfield land. An estimated 66,000 hectares of previously developed land are now unused or available for redevelopment (an area approaching half the size of urban Greater London) (Maslen *et al* (2003).

English Partnerships, the regeneration agency for England, have identified in their analysis of the National Land Use Database, a 'hardcore' of sites, which have been vacant or derelict for more than 10 years (Regeneration Magazine, 2003). It has been suggested that at the present time developers are 'cherry-picking' the easiest sites for regeneration, which is allowing the 60% target to be achieved. It has been questioned whether the target of 60% will continue to be met in the future as sites become more uneconomical to develop (Regeneration Magazine, 2003). This may put added local political pressure on local authorities to use the provisions of Part IIA to deal with contaminated sites.

Current government policy, which requires local authorities to identify previously used sites for development, will have the potential impact of bringing sites forward for development that may otherwise have been assessed in terms of Part IIA. It is suggested that this would be a positive outcome, in that it removes the responsibility of enforcing remediation away from local authorities. Conversely, local authorities will be faced with an increasing amount of site investigation reports submitted as a requirement of obtaining planning consent. Therefore, staff responsible for assessing contaminated land under Part IIA may be required to spend more time assessing reports submitted as part of planning applications, in order to meet internal planning targets. This then has the knock-on effect of slowing progress with the contaminated land strategy.

There seems to be an expectation amongst some stakeholders that Part IIA will achieve more than it will actually deliver. In its final report the Urban Task force states that "The new regulatory system will capture those sites which have the potential to cause significant harm but many will remain contaminated for the time being" (Urban Task Force,2000:245). It is argued in Chapter 9 that Part IIA will only bring a very small proportion of sites back into beneficial use for new development. The threat of possible action under Part IIA may bring some sites forward for development but it is argued that the majority of sites which will be dealt with under the new regime are sites where there is going to be a continued current use e.g. residential properties, allotments, landfill sites.

4.7 TARGETS FOR THE PRIORITISATION, INVESTIGATION AND REMEDIATION OF CONTAMINATED LAND

Part IIA and the supporting Statutory Guidance does not specify any targets for the prioritisation, investigation and remediation of contaminated land. Local authorities may set targets that reflect individual circumstances. The Statutory Guidance states that sites should be prioritised so that the areas where contaminated land are most likely to be found are dealt with first.

The timescales adopted by individual local authorities will differ considerably according to geographic area, geology, historic use of land, regeneration, available resources and technical/local knowledge. It is probable that most local authorities will provide a target for completing the initial prioritisation of potentially contaminated sites. A further target may then be set for undertaking further prioritisation and assessment. However, this target may be subject to change depending on the outcome of the initial prioritisation. The Statutory Guidance suggests that within each strategy document local authorities specify a review period at which time targets may be reassessed. Through empirical research this thesis assess and review the targets set by local authorities for the prioritisation, investigation and remediation of contaminated land. As part of this research it will be interesting to note whether local authorities are achieving their targets and if there is the possibility of local authorities being 'named and shamed' where targets are not met.

4.8 COMMUNICATION

The local authority inspection strategy will provide details of how information from third parties should be provided regarding potentially contaminated land and how this will information will be incorporated into existing priorities. A potential concern of staff at Barnsley MBC during the pilot study (see Chapter Six) is that they may have to deal with a number of vexatious calls providing inaccurate information. The procedure laid out in the local authority strategy should reduce such problems. The extent of such problems will be investigated as part of this research enquiry.

Local authority strategies may also include specific communication procedures relating to land with *significant pollutant linkages.* These procedures may give details of how risks will investigated, who will be involved, methods of disseminating information, timescales, dealing with media etc. Such communication strategies will provide a basis on which local authorities can provide information to affected parties.

Difficulties may be faced by local authorities in relation to sites where a soil guideline value doesn't yet exist for a particular contaminant or where there is some debate regarding the applicability of an existing SGV to a particular site. The Totley case study in Chapter eight also highlights the lengthy timescales that may be involved from the initial investigation to undertaking the necessary remediation. Local authority communication management skills in dealing with contaminated land will be extremely important in relation to the implementation of Part IIA. This research seeks to identify examples of successful methods of communication where contaminated land has been identified.

4.9 LOCAL AUTHORITY STRATEGIES – CURRENT INFORMATION

The Environment Agency Report *Dealing with Contaminated Land in England* (EA, Sept, 2002) provided "an overview of progress made in identifying and remediating contaminated land".

The Environment Agency reported that by July 2002, 94% of local authorities had published their final inspection strategies (EA, Sept 2002:13). Twenty local authorities had failed to publish their final inspection strategy, nearly 12 months after the initial deadline contained in the Statutory Guidance. In July 2003 two local authorities still had to formally adopt a written strategy (Environment Agency, 2003b).

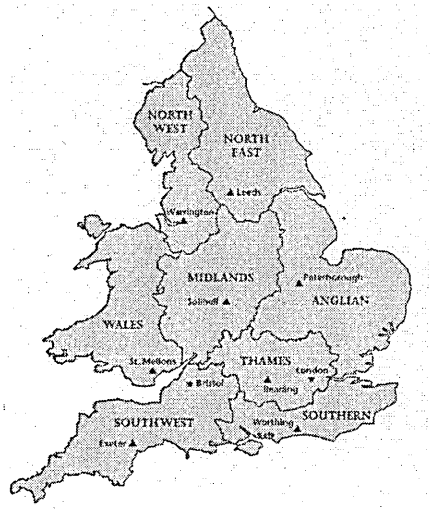
The report states that by the end of March 2002, 33 sites had been designated as contaminated land, of which 11 had been designated as special sites. The Environment Agency stated that it had also agreed to inspect a further 31 special sites. The report states that:

> *The number of sites determined is low because local authorities have concentrated on preparing a strategy for inspecting their land and have not yet finished inspecting their areas. This number is expected to increase as the inspection progresses.*
> (EA, Sept 2002:1).

However, there may be other factors which are influencing the number of sites determined as contaminated land such as limited funding, lack of confidence in relation to potential legal challenges, local authority promotion of voluntary action through the planning regime and incomplete technical guidance. The factors influencing local authority determinations have been assessed as part of this research project.

According to the Environment Agency (Environment Agency, 2003b) 98% (347), local authorities had published their final inspection strategy by July 2002 with the remaining 2% (6) at the consultation process. Figures from the Environment Agency (Environment Agency, 2003b) state that 58 sites have been determined as Contaminated Land in England. Of these 14 are Special Sites. In addition the Environment Agency has agreed to inspect a further 15 potential special sites (Environment Agency, 2003b). A regional breakdown of these determinations is provided in Table 10 below.

Table 10 Contaminated Land Determinations and Special Sites in England According to Environment Agency Regions



Region	Contaminated Land Determinations	Designation as Special Sites
Anglian	11	2
Midlands	4	1
NE	9	4
NW	6	0
Southern	6	0
SW	10	5
Thames	12	2
Total	58	14

Source: Table Based on Information Supplied by The Environment Agency, 2003b. Map Reproduced from EA (2002)

4.10 SUMMARY AND KEY QUESTIONS

This Chapter has highlighted a number of key areas relevant to the local authority inspection strategies and the consequences in terms of the effective implementation of Part IIA. Section 4.9 highlights that there has not yet been a significant amount of regulatory action with respect to Part IIA.

Strategies are unlikely to differ considerably in structure and content in terms of meeting the basic requirements of the strategy document as stated in the Statutory Guidance. The differences are likely to relate to factors such as resources, quality and management of existing information, technical knowledge, amount of regeneration activity and political priority place on contaminated land by individual local authorities. Key questions will be generated to investigate the following areas of local authority activity in relation to their contaminated land inspection strategy:

- Resources - existing and proposed -
- Quality of information
- Information Management
- Existing knowledge of contamination in local authority areas

- Technical knowledge and training requirements
- Amount of regeneration activity and impact on Part IIA
- Political importance placed on Part IIA by local authorities
- Proposed Timescales
- Methods of prioritisation and further assessment
- Communication methods
- Provision of Guidance
- The number of potentially contaminated sites in individual local authority areas.

Responses to the above areas of investigation will provide an insight into the ability of local authorities to implement their inspection strategy.

Chapter five presents the research methods used to assess the current regulatory framework for the identification and remediation of contaminated land and establish whether local authorities can effectively identify contaminated land given the current level of resources and technical guidance.

CHAPTER 5
RESEARCH METHODS

5.1 INTRODUCTION

This thesis is concerned with the regulation of contaminated land and the way in which local authorities in England have prepared for and are now implementing Part IIA of the Environmental Protection Act 1990. The research seeks to identify potential resource constraints, technical deficiencies and the defensibility of using a risk assessment methodology for the identification of contaminated land.

The research examines the strategic decision making processes of local authorities charged with a legal duty to identify contaminated land in their area. The thesis also examines the wider implications of Part IIA for the redevelopment of other land, which falls outside the statutory definition of 'contaminated land' but is affected by the presence of contamination.

5.2 POTENTIAL BARRIERS IDENTIFIED AS A RESULT OF THE LITERATURE REVIEW

Part IIA of the Environmental Protection Act 1990 and supporting guidance provide a framework that is intended to allow local authorities to regulate sites using a systematic risk-based methodology. Under the provisions of the supporting Statutory Guidance (DETR, 2000) local authorities are required to "prepare, publish and adopt a strategy detailing how it intends to identify contaminated land in its area taking into account such things as historic land use, local geography, population and present urban characteristics.

At the time that S.57 of the Environment Act 1995 retrospectively inserted Part IIA into the Environmental Protection Act 1990 the Government had not proposed any additional funding for local authorities. Following a comprehensive spending review undertaken by Labour Administration in 1998 a sum of £12m would be provided to local authorities in England to prepare and implement their strategy for identifying contaminated land. These funds would

be allocated via funding provided in the general Standard Spending Assessment (SSA). Any additional funding provided in this way is not 'ringfenced' and can potentially be used for other local authority services depending upon local political importance.

The identification of contaminated land is a potentially time consuming process that requires technical knowledge of undertaking risk assessment in relation to contaminated land. The introduction of Part IIA places an additional requirement on local authority resources which were potentially already overworked dealing with other environmental regulatory work e.g. air quality, Part B authorisations and statutory nuisance.

Individual local authority decisions about implementation do, and the strategic approach adopted by local authorities does, have wider implications for the re-use and regeneration of land that is affected by the presence of contamination. Local authorities are likely to receive increasing requests for information about the status of land from investors, developers and potential owners and occupiers. Some sites may be 'blighted' by local authority indecision or delay in implementing their strategy as potential purchasers await decisions about whether a site is likely to be determined as contaminated land in accordance with Part IIA.

The review of literature has identified that Part IIA is a policy which is likely to be difficult for local authorities to implement. Local authorities have not been provided with a standard method of prioritising land for further inspection, there appears to be a lack of sufficient guidance relating to soil guideline values and the acceptability of site-specific risk assessments. It is unclear how well trained regulators are in undertaking contaminated land risk assessments. There are potential legal problems in determining responsible parties for the costs of remediation and the potential threat of legal challenges. It is also unclear whether the funding that has been provided so far by the Government in the form of Standard Spending Assessment and Supplementary Credit Approval is sufficient. The political priority placed on the identification of contaminated land will also need to be investigated along with the impact of the regeneration

process, as these will also have an impact on the effective implementation of Part IIA.

Having identified potential barriers to the effective implementation of Part IIA within the literature review, a research methodology was adopted to identify local authority decisions and actions during the early stages of implementation. The methodology uses focus group discussion, questionnaire surveys, face-to-face interviews and case studies. The methodology evolved over a 5 year period of implementation adapting to take into account numerous delays by the Government in issuing the supporting Statutory Guidance. As stated in Chapter Two it was originally anticipated that the Statutory Guidance would be issued by the Secretary of State for the Environment in April 1997. However, the Statutory Guidance wasn't actually issued until 1st April 2000 and therefore had a significant impact on the anticipated programme of research.

5.3 THE RESEARCH METHODOLOGY

Within the social sciences there are two distinct theoretical schools of thought with which to measure or describe the particular experience or phenomenon that we are interested in. These are positivist social science or non–positivist (humanistic) social science.

5.3.1 The Positivist Approach

> *"Positivism takes it as axiomatic that there is a real world which has determinate characteristics, and the purpose of science is to model this world in its theories. These theories will show how certain variables inter-relate, especially how they relate to each other in a cause and effect fashion"*
> (Ashworth, 1997, pg 217)

With the positivist approach "*it is both possible and desirable to make a firm distinction between facts and values*" (Furbey, 1997 Pg:13). The 'world' or subject under investigation is therefore described according to the knowledge and experience of the individual researcher undertaking the study and is "*independent of anyone's preferences or prejudices*" (Furbey, 1997: Pg:13).

> *"The positivist approach assumes that an individual's interaction with a particular system is automatic and is governed by certain rules and do not allow for individual interpretation and action. For positivists, people are the passive recipients of these external forces which cause them to act in a certain way, just as if they were pieces of bromide paper responding in a predictable way to a common light intensity and duration"*
> (Furbey 1997, pg 19).

The phenomenon being studied in this research is a new regulatory regime which will potentially have greater impacts on some local authorities than others. The structure of Part IIA does provide the researcher with some natural categories within which to establish the progress of implementation (e.g. has a strategy been produced yet?).

> *"One part of the continuing appeal of positivist research is its declaration of clear, precise, unequivocal criteria for distinguishing scientific fact from personal opinion"*
> (Buchanan, 1998:447)

A positivist methodology can be utilised in research of this kind, but it has the disadvantage that it only provides a 'snapshot' of active implementation at any one point in time. In addition the positivist approach does not provide greater insight into any issues relating to the regulation of contaminated land encountered by individual local authorities.

> *"The conservative philosopher Oakeshott (1975) makes the distinction between processes in the natural world and human practices. Natural processes are embedded in the very structure of nature; they are the inherent product of the composition and configuration of the component elements....In contrast, human practices require intelligence; they need to be learned, understood and granted one's assent"*
> (*cf.* Buchanan, 1998:440)

5.3.2 The Non- Positivist Approach

There are a number of schools of thought that have developed applicable to non-positivist social science. Non-positivist (humanistic) approaches include phenomenological, hermeneutic and discourse analysis.

- The phenomenological approach is descriptive and seeks to provide a true account of an area of experience. (Ashworth, 1997. Pg 219).
- The hermeneutic approach is interpretive and aims to show ways of making sense of experience. (Ashworth, 1997. Pg 219).
- Discourse analysis draws out socially available modes of thinking and action which reveal themselves in qualitative data. (Ashworth, 1997. Pg 219).

Even within tightly regulated systems, individuals and groups are capable of making alternative decisions which would not be understood within the positivist approach. It is therefore argued that the way in which contaminated land is regulated by individual local authorities requires a non-positivist research methodology to provide a wider understanding of how and why individual local authority decisions have been made. The non-positivist approach enables participants to describe their experience or 'life-world' as they see it (Ashworth, 1997, Pg.220). The non-positivist methodology enables greater meaning to be attributed to emerging themes is not restricted to simply identifying cause and effect relationships within a given hypothesis.

This research enquiry adopts a predominantly humanistic approach in order to identify local authority progress in relation to Part IIA and gain an understanding of the wider implications of the new policy. Buchanan (1998) suggests that the use of the humanist approach promotes the use of 'practical reasoning' on the part of the researcher rather than simply testing a 'blind' theory testable within a positivist approach.

> "The purpose of developing practical reason is not to predict, control or change anyone, but to deepen our understanding of what it is to live a human life, to contribute to human self understanding and decency"
> (Buchanan, 1998:438)

This methodological approach takes account of the variability between local authorities in terms of geography, population, politics, and historical land use. It therefore provides a contribution to knowledge relating to a new policy process as experienced by those people responsible for its implementation.

5.3.3 The Overall Aim and Objectives

The literature review described in Chapters two, three and four suggest that Part IIA may not be implemented effectively due to lack of resources, insufficient technical guidance and the potential cost of a legal challenge. There is also the potential that ineffective regulation of contaminated land by local authorities in England will a have negative impact on the wider development of brownfield land.

This research utilises both positivistic and humanistic research methods in order to achieve the aim and objectives. The positivist approach enables the researcher to measure the effects of the regulatory regime based on his own knowledge of the phenomenon being studied. The humanist approach is used to obtain greater insights relating to the regulation of contaminated land as it applies to individual local authorities.

The overall aim of the research is to critically assess the current regulatory framework for the identification and remediation of contaminated land and establish whether local authorities can effectively identify contaminated land given the current level of resources and technical guidance.

The principal research objectives are as follows:

- *To review and critically assess current literature relating to contaminated land policy and risk assessment. The review also includes an evaluation relating to the wider implications of implementation of Part IIA on the regulation of land affected by contamination under the Planning Control regime.*
- *To develop and evaluate (in conjunction with Barnsley MBC) a sample methodology for prioritising land for further investigation.*
- *To evaluate alternative contaminated land policy approaches in other countries and identify a case study example which could be adopted in England.*
- *To assess local authority preparations for the implementation of Part IIA and evaluate current progress in relation to the regulation of contaminated land.*
- *To compare different local authority strategic approaches to the identification and assessment of contaminated land including the identification of roles and responsibilities within individual local authorities*
- *To identify the cost of implementing Part IIA for individual local authorities and present possible solutions where shortfalls are identified.*
- *To assemble and critically appraise examples of local authority regulatory action under the provisions of Part IIA*
- *To examine possible barriers to the effective implementation of Part IIA and where possible present possible solutions.*

5.4 GENERAL RESEARCH ISSUES

One of the factors noted already in this Chapter is that, when using a humanistic approach, the validity of the findings can be measured from multiple perspectives and by reference to research which has already been undertaken (Buchanan, 1998:448). The stated aims and objectives of this research enquiry

were generated from literature and adapted as a result of early research findings.

The data collected in this research in order to achieve the aim and objectives was not confined to a single research method. Due to delays in implementing Part IIA, and changes in the researchers mode of study from full-time to part-time a longitudinal approach has, in effect, been adopted. This therefore provided a measure of local authority progress over a five-year period.

When undertaking any research there are a number of considerations that need to be taken into account when deciding upon a particular research method. This research involved the use of a number of different research methods, including a focus group discussion, two questionnaire surveys, semi-structured interviews and case studies. Each research method has its own particular advantages and disadvantages depending on the desired objective and will be described in relation to each method later in this Chapter. There are some general concepts which need to be considered, irrespective of the method chosen and these are described below.

5.4.1 Reliability & Validity

Patton argues that the reliability and validity of qualitative data are largely dependent on "the methodological skill, sensitivity, and integrity of the researcher". (Patton, 1990:11).

> "*Reliability refers to the stability, consistency, and precision of the meaning instrument*" (Ashworth, 1997: 217).

Reliability of qualitative data cannot be measured in the same way that it is measured for qualitative data. Quantitative data can be measured and tested in relation to already understood models.

> "*A measure which fails to obtain consistent answers can be said to be unreliable. For instance, similar questions at the same time, or on two occasions should be answered in the same way (where there is no evidence that the answers ought to have changed)*"
> (Ashworth, 1997: 218).

The reliability of qualitative enquiry is almost impossible to measure. The responses given are those of the interviewee and are not open to question. The

interviewee may not be telling the truth. Qualitative interviews cannot be used to generate models in the same way as quantitative methods since the meaning given to certain statements may be the interpretation of the researcher and may not be what was meant by the interviewee. However, the reliability of the interpretation may be tested by reference to other interviews and allowing other researchers to interpret the data (Yeandle, 1997: unpublished).

> *"We gain confidence in the quality of humanistic research the more closely it is tied to specific concrete material events and the more closely it builds on prior research (even while pointing out its inadequacies and proposing consequent refinements and amendments). We look to assess its quality by the degree to which it is precise..., accurate (neither omissions nor fabrications; corroborated from multiple perspectives), authentic (documented; free of distortions; aware of its limits) and persuasive"*
> (Buchanan, 1998:448)

Validity refers to a number of different things, all to do with whether or not the measuring instrument is actually measuring the variable that it is intended to measure. "*The use of other people, colleagues, interviewee, expert judges and so on – is crucial to the considerations of validity in interpreting data from qualitative research interviews*" (King 1994: 32). However, *"the researcher is debarred from querying the validity of the life-world*" (Ashworth 1997b: 220). Therefore the validity of the interpretation can be measured by other people but the interviewer cannot question the processes which make up the interviewees life-world.

> *"...there are no criteria in humanistic research that offer the same degree of certainty as those used in the natural sciences. Humanists accept that their interpretations are always 'essentially contestable' (Geertz, 1973:29)... the ultimate guarantor of the truth of assertion about the social realm is ...the mutual assent of those affected by the claims"*
> (*cf:*Buchanan, 1998:447)

5.4.2 Objectivity

The objectivity of the researcher may be questioned in relation to the overall reliability and validity of any research undertaken. This is especially true in relation to this particular research project where the researcher was involved with contaminated land issues, initially in a collaboration with one local authority and then in employment with another. Therefore, when interpreting the research data, it was necessary to look outside one's own ideas and opinions in order to check that the views reflect the findings of the research and not the

opinions of the researcher. The objectivity of the findings may also be reviewed by an independent person external to the main research.

There are also ethical considerations relating to objectivity in order that the findings are not biased towards the particular ends of a contributing local authority.

5.4.3 Ethical Considerations

There were a number of ethical considerations relating to the research undertaken as part of this thesis. At all stages of the research programme where individuals were being interviewed they were advised that their names and the names and affiliation would not be revealed – unless their prior consent had been requested and received.

The purpose of the research was identified to all participants either by letter or before any interview. It was necessary to keep all information confidential as there may be some financially sensitive information which one local authority would not wish to divulge to another authority.

The Social Research Association (2002) has updated previous advice published in 1998 and provided a checklist that is intended to:

> *"act as a comprehensive stimulus to ethical considerations throughout a project. Such a checklist prompts the making of clear statements of intent, mechanisms of approach and consideration of hazard arising from research in a manner which can be understood by laymen and research professionals alike".*
> (SRA, 2002:25)

Box 7 provides the suggested ethical considerations suggested by the Social Research Association. Throughout this research project these ethical considerations have been reviewed prior to undertaking each stage of the research.

Box 7 Ethical Considerations in Social Research

1. **PROJECT TITLE:** This offers a quick reference for any interested party and indicates the broad sphere of interest.
2. **EXPECTED DURATION:** Gives some indication of commitment required of subjects and time given by researcher.
3. **IDENTITY OF FIELD RESEARCHERS AND ORGANISATIONAL BASE:** A list of names, positions, qualifications and functions in the proposed research of all those holding responsible positions and who might be in direct contact with subjects. This offers an estimate of competence together with a chain of responsibility and accountability.
4. **PURPOSE OF STUDY:** Aims and objectives might indicate hypothesis testing, policy evaluation, and any potential "value" added to the subject group and/or society in general.
5. **SOURCES OF FUNDING:** The organisation, individual or group providing the finance for the study.
6. **SCIENTIFIC BACKGROUND:** Some rationale for conducting the study should be offered. If this investigation has been done previously, why repeat it? What research methods are being employed? Why and how was the subject/respondent chosen? Any specific sampling technique adopted must be disclosed.
7. **DESIGN OF THE STUDY:** Describe briefly what will be done and how the subjects are to be expected to participate. What will be required of them? All procedural matters should be clarified. Time commitments and data-collection settings should be revealed. Data analysis methods and procedures should also be clarified.
8. **POTENTIAL BENEFITS AND HAZARDS:** What risks to the subject are entailed in involvement in the research? Are there any potential physical or psychological dangers that can be anticipated? What is the possibility for benefit to the subject from participation? What procedures have been established for the care and protection of subjects (e.g. insurance, medical cover) and the control of any information gained from them or about them?
9. **RECRUITMENT PROCEDURES:** Is there any sense in which subjects might be "obliged" to participate – as in the case of students, prisoners, or patients – or are volunteers being recruited? If participation is compulsory, the potential consequences of non-compliance must be indicated to subjects; if voluntary, entitlement to withdraw consent must be indicated and when that entitlement lapses. Researchers should ascertain that participants are not involved in any other studies which would be either disadvantageous to their own health or the benefit of the current study.
10. **INFORMED CONSENT:** Where appropriate, consent of participants MUST be requested and put in terms easily comprehensible to lay persons. This should be both ORALLY and also in WRITTEN FORM and preferably should be witnessed. An information sheet setting out factors relevant to the interests of participants in the study must be written in like terms and handed to them in advance of seeking consent. They must be allowed to retain this sheet.
11. **DATA PROTECTION:** The project should comply with the requirements of current data protection legislation and how this is accomplished should be disclosed to participating subjects and those monitoring the research procedure. This should include proposed data storage arrangements, degree of security etc. and whether material facts have been withheld (and when, or if, such facts will be disclosed).
12. **CONFIDENTIALITY AND ANONYMITY:** The steps taken to safeguard the confidentiality of records and any potential identifying information about the subject must be revealed.
13. **MONITORING OF THE RESEARCH:** Organisational procedures for monitoring the project should be available for inspection.
14. **DISSEMINATION OF FINDINGS:** What is the anticipated use of the data, forms of publication and dissemination of findings etc. ?

Source Social Research Association, 2002:pp25-27

5.4.4 Access

In addition, to the methodological skill, sensitivity and integrity of the researcher, the ability to identify the appropriate person who has direct involvement with the implementation process was an essential element of understanding how local authorities will regulate contaminated land. Through previous research experience as research assistant on the Joseph Rowntree funded *Redevelopment of Contaminated Land for Housing* (Syms, 1997) contact had been made with a number of local authority environmental health officers and development control planners with a responsibility for regulating contaminated land.

In addition, the initial collaboration with Barnsley Metropolitan Borough Council in producing a pilot strategy for identifying contaminated land provided a

gateway into an established regional group concerned with matters relating to the regulation of contaminated land. The Yorkshire and Humberside Pollution and Advisory Council (YAHPAC) Land Sub Committee met on an ad - hoc basis and consisted of ten Environmental Health Officers from both urban and rural local authorities in the Yorkshire and Humber region. As the research progressed, further contacts were established in other areas as a result of the questionnaire survey and direct telephone contact. Throughout the research it was necessary to established named contacts who would be willing to participate in the research and who would have direct responsibility for implementing Part IIA.

One particular difficulty in gaining access to the relevant person, was the fact that within most local authorities the 'contaminated land expert' was often responsible for other regulatory duties such as inspecting Part B authorised processes, air quality monitoring and dealing with statutory nuisance complaints. Due to time constraints and travelling distances between local authorities, it was often difficult to arrange interviews with more than three local authority officers in one day.

5.4.5 Limitations

The limitations of the research were generally restricted to resource issues and timing. As with most projects of this nature resources are limited. The resources did have an impact in some parts of the study, especially in relation to the initial questionnaire surveys (this aspect is discussed in more detail later in this Chapter). Resources and time were limiting factors when choosing the regions to be involved in the interview phase of the study. Whilst the number of local authorities interviewed as part of this research was limited to 40, it is argued that due to the diverse nature of the local authorities which participated, the findings are representative and it is a better than 11% sample of the Country as a whole.

5.5 THE RESEARCH METHODS PROGRAMME

There were a number of distinct phases to this research project which were aimed to fulfill specific objectives within the research programme. Each of these phases is described below.

5.5.1 The Barnsley Collaboration

The first phase of the research involved a collaborative project with Barnsley MBC and the development of a prioritisation framework. This was largely undertaken by reviewing existing datasets, informal interviews with relevant staff members and discussions with external consultees.

The findings of this phase of the research were based on separate aims and objectives that were identified in consultation with the Barnsley MBC, but were applicable within the wider research aims and objectives of this thesis. There were potential ethical considerations relating to potentially confidential information and the potential that Barnsley MBC may wish to control the research and the findings. This particular issue was avoided because it was agreed that the information gathered and the conclusions should be seen as 'independent' from the local authority.

Chapter 6 provides further information relating to the specific aims and objectives, data sources used and people consulted during this part of the research.

5.5.2 The Focus Group Discussion

The second phase involved a focus group discussion with nine Environmental Health Officers who were members of the YAHPAC Land Sub Committee, two Development Control Planners and an Environment Agency Officer. The group discussion was undertaken on 2nd December 1998, five months prior to the anticipated implementation of Part IIA.

Kruegar suggests that "*focus groups are composed of people who are similar to each other*" (Kruegar, 1994:17). All the participants in this discussion group were familiar with developments in policy relating to contaminated land and general concepts relating to risk assessment. Indeed most of the participants were known to each other. This aspect was seen to be advantageous, in that members did not feel unwilling to contribute due to lack of confidence or knowledge about the topic under discussion.

The focus group consisted of thirteen people and it was therefore important that the interview was 'managed' carefully in order to avoid it becoming dominated by a few people, and to enable the 'quieter' members of the group to voice their opinions. The responsibility for moderating the focus group was achieved by the researcher undertaking the interview with an experienced moderator.

> "*The main purpose of focus group research is to draw upon respondents' attitudes, feelings, beliefs experiences and reactions in a way in which would not be feasible using other methods....*"
> (Gibbs, 1997:2)

The advantages of a focus group discussion over methods of research such as the face to face interview, is that it can save the researcher time in reduced travelling and the number of times that an interview has to be performed. In addition:

> "*Focus group interviews also provide some quality controls on data collection in that participants tend to provide checks and balances on each other that weed out false or extreme views. The group's dynamics typically contribute to focusing on the most important topics and issues in the program, and it is fairly easy to assess the extent to which there is a relatively consistent shared view of the program among participants.*"
> (Patton, 1989:336).

The purpose of the focus group was to provide an indicative measure of local authority preparations in relation to the possible implementation of Part IIA. The responses would be used to guide later research undertaken as part of this thesis. Five discussion topics were developed in order to establish progress; anticipated effects of the legislation; working relationships, internally and externally; and perceived interaction with the planning process.

The first question was designed to identify which department with the local authorities represented would be responsible for implementing Part IIA. This discussion topic also sought to identify what information was already available to local authorities, how, would be interpreted and stored.

The second discussion topic related to the way in which information would be used as part of a wider prioritisation strategy and confidence levels required before investigating potentially contaminated land.

Groundwater and controlled waters were discussed as part of topic three. The purpose of this discussion topic was to try and identify the relationship between local authorities and the Environment Agency in relation to the regulation of contaminated land.

Discussion four presented a potential scenario that could cause conflict between the development control system and Part IIA.

The fifth discussion topic was a review of local authority progress in preparing for the implementation of Part IIA and the potential cost of producing and implementing a strategy.

5.5.3 Supplementary Focus Discussion Group Questionnaire

At the end of the focus group a questionnaire was handed to each of the participants. The participants were asked to identify the most important issues and concerns relating to the future regulation of contaminated land. Twenty spaces were provided so that issues of importance could be ranked.

The issues identified and ranked by the participants were assigned a score relative to their rank. For example an issue such as 'lack of staff' ranked 1 by the participant would score 20 and an issue such as poor guidance ranked 20 would score 1.

The participants were free to describe and list the issues that were important to their particular authority and were not restricted to an assigned list of issues supplied by the researcher. The reason for this was to provide an indication of the relative priority local authorities placed on issues discussed during the focus group.

5.5.4 The Questionnaire Survey

The third phase of the study involved a structured questionnaire survey undertaken in July 1999. The questionnaire comprised 17 questions and was sent to a representative sample of 150 local authorities in England to establish preparations for the implementation of Part IIA.

The purpose of the questionnaire phase was to establish local authority progress based on some of the ideas and themes identified from the focus group. It would also enable some statistical data to be collected about local authority activity in relation to Part IIA, as well as providing access to other potential participants for the interview phase in later states of the research.

The questionnaire was sent to 150 local authorities, just less than half the total number of local authorities in England (354) and were chosen selectively in order to get a reasonable spread of different types of local authority in England. The split between authority were as follows:

- 20 London Borough authorities
- 10 Unitary Authorities
- 120 district and borough councils which were divided further, into those that were perceived to be smaller urban or rural authorities, and those that were perceived to be larger urban and rural authorities.

The advantages of the questionnaire survey are that it is relatively quick to administer (Bryman,2001:129) and also it is possible to reach a geographically dispersed group quickly (Bryman, 2001:129).

Disadvantages of the questionnaire survey may relate to:

- The inability to prompt and probe questions further
- The inability to ask too many questions due to the possibility of 'respondent fatigue'
- Greater risk of missing data or misinterpretation
- Lower Response Rates

An attempt was made to maximise the response rate by sending the questionnaire to a named individual. Where possible the name had been identified or confirmed by contacting each local authority directly prior to sending out the questionnaire. However, it was not always clear who had responsibility for answering such questionnaires and in a number of cases the questionnaire was simply sent to the named Head of Department who would then be responsible for identifying the most appropriate person. The questionnaire also provided a prepaid envelope in order to encourage returns. Bryman (2001) recommends sending out a repeat questionnaire two weeks after the original as a 'reminder' (Bryman, 2001:131). However, resource constraints meant that this was not a possibility as part of this research programme.

There are inevitably other factors that will effect the response rate. Factors such as workload and the respondent's own willingness to complete the questionnaire due to the fact that it is a voluntary process.

The questionnaire was kept relatively short with only 17 questions. The information requested on the questionnaire was divided into two. The majority of the survey required factual information about progress with the implementation of Part IIA. A copy of the Questionnaire is provided in Appendix 3.

Question six adapted a table that had been presented in Syms' *Desk Reference Guide to Potentially Contaminative Land Uses* (Syms 1999). In this text Syms presented a risk based classification of land uses based on 39 potentially contaminative uses. This table presented a hazard ranking score for these industries based on the perceived risk of valuers, lawyers and developers. Question six presented a modified table based on 30 industries. The reduction

in number of industries was to try and maintain a reasonable response rate. It was felt that the requirement to rank 39 industries would put some people off completing the whole questionnaire. Syms' table has been criticised by Nathanail (Sept,1999) as 'unhelpful' because, interpreted incorrectly, could lead to the misinterpretation of a site's real risk.

This ranking exercise, in question six, was carried out with local authority officers to identify the sites that they perceived would constitute the most significant risk. It is argued that this is important from a prioritisation point of view because it may be that the choice and prioritisation of sites in certain circumstances are based primarily on the perception of risk held by the local officer responsible. A number of local authorities have used Syms' hazard ranking score as part of a risk prioritisation tool. (e.g. Trafford MBC and Bristol CC).

Microsoft Excel was used to analyse the data from the questionnaire. The responses to the 'open-ended' questions were assessed and grouped into emerging themes, e.g. 'lack of resources'.

The response rate to the questionnaire phase was 48%. Although this may be seen as a reasonably good response rate, the failure to achieve a higher response rate was seen to be the result of a number of factors. First because of delays in issuing the proposed Statutory Guidance; second due to a similar postal survey which was sent to all the local authorities in England just weeks earlier, with the support of the Chartered Institute of Environmental Health; and also due to the timing which coincided with 'summer holidays'.

5.5.5 The Comparative Study in Cleveland Ohio, USA

During the period of delays in issuing the statutory guidance, funding was obtained by the author from the RICS Education Trust to undertake a comparative study in Cleveland Ohio, USA. Under the guidance of Professor Robert Simons of the Levin Institute of Urban Affairs in Cleveland Ohio, an empirical study was undertaken to find out how contaminated land was identified, assessed and remediated in Ohio State. This study involved five

face-to-face interviews and the preparation of a case study describing a system of identifying contaminated land in the United States. The purpose of the study was to determine alternative methods and potential benefits in England. Chapter 7 provides further details about the research methods relevant to the this element of the research.

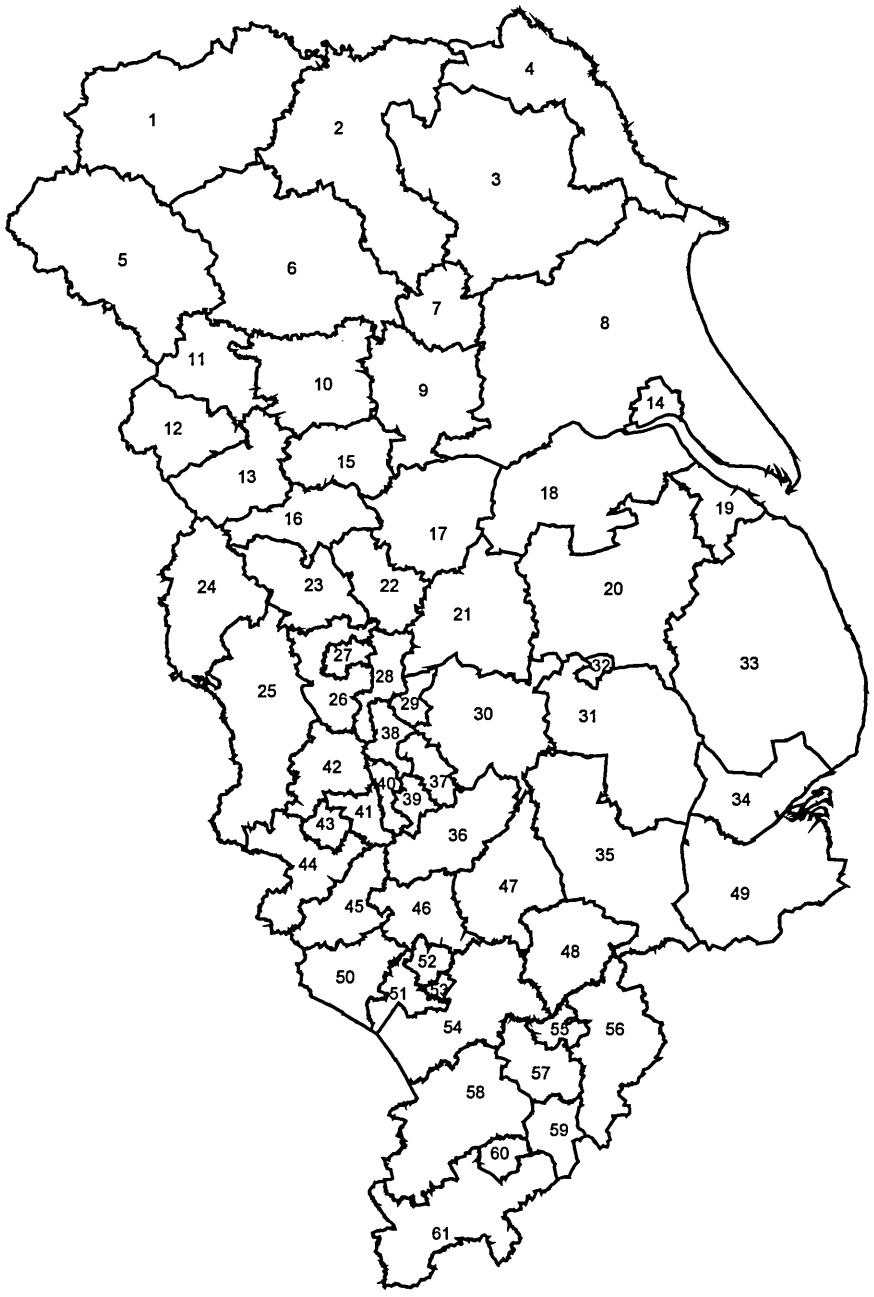
5.5.6 The Interview Phase

Following the formal issuing of the Statutory Guidance on 1st April 2000 an interview phase was undertaken with local authority representatives responsible for regulating contaminated land in the Yorkshire and Humber and East Midlands Regions. The Yorkshire and Humber Region is made up of North Yorkshire, South Yorkshire, West Yorkshire, East Yorkshire and Kingston Upon Hull. The East Midlands Region consists of Derbyshire, Nottinghamshire, Lincolnshire, Leicestershire, Northamptonshire and Rutland. There are a total of 61 local authorities in these two regions. Figure 7 shows the geographical area of covered by the interview phase of the research.

The number of regions was limited due to various time constraints and financial implications associated with undertaking a wider survey. Forty local authority representatives agreed to participate in this phase of the research. It is argued that these local authorities provide a wide spread in terms of land-use (past and present), size, population, political control and economic regeneration. Lack of progress with the implementation of Part IIA meant that a number of local authorities did not want to participate, either because they had "*done nothing to talk of*" or couldn't spare the time to be interviewed due to resource constraints and other priorities.

A qualitative analysis was undertaken involving semi-structured interviews with local authority officers responsible for the implementation of Part IIA. The advantage of using semi-structured interviews is that they allow the interviewees to identify and describe the complexity of their life-world in their own words (Ashworth 1997:220). The qualitative interview can also identify the unanticipated outcomes of policies as well as the inconsistencies and conflicts built into policies (Marshall & Rossman, 1995:11).

Figure 7 A Map of the Yorkshire and Humber and East Midlands Regions



Richmondshire District	1	Bassetlaw District	21	Erewash District	41
Hambledon District	2	Rotherham District	22	Amber Valley District	42
Rydale District	3	Sheffield District	23	City of Derby	43
Scarborough District	4	High Peak District	24	South Derbyshire District	44
Craven District	5	Derbyshire Dales District	25	North West Leicestershire District	45
Harrogate District	6	North East Derbyshire District	26	Charnwood District	46
York	7	Chesterfield District	27	Melton District	47
East Riding of Yorkshire	8	Bolsover District	28	Rutland	48
Selby District	9	Mansfield District	29	South Holland District	49
Leeds District	10	Newark and Sherward District	30	Hinckley and Bosworth District	50
Bradford District	11	North Kesteven District	31	Blaby District	51
Calderdale District	12	Lincoln District	32	City of Leicester	52
Kirklees District	13	East Lindey District	33	Oadby and Wigston District	53
City of Kingston upon Hull	14	Boston District	34	Harborough District	54
Wakefield District	15	South Kesteven District	35	Corby District	55
Barnsley District	16	Rushcliffe District	36	East Northamptonshire District	56
Doncaster District	17	Gedling District	37	Kettering District	57
North Lincolnshire	18	Ashfield District	38	Daventry District	58
North East Lincolnshire	19	City of Nottingham	39	Wellingborough District	59
West Lindsey District	20	Broxtowe District	40	Northampton District	60
				South Northampton District	61

The semi-structured interview focuses on a number of issues of primary concern whilst being flexible enough to allow other related issues to be discussed. In order that valid claims can be made such interviews require the participants to be able to recount their experience and communicate that experience in a way that the interpreter will understand it. Care must also be taken with such interviews as presuppositions or leading questions may influence meaning and the interviewee's perspective of truth (Babbie, 1998:264; Marshall & Rossman, 1995:80).

The interviews were undertaken using a vignette and recorded (with the interviewees' permission). The interviews were then transcribed verbatim in order to enable more detailed analysis. The partial structuring of the interview made the analysis easier in that familiar themes are sometimes more identifiable (Newman, 1994:134).

The Semi-structured interview questionnaire included 33 questions which were intended to build upon the knowledge gained as part of the questionnaire survey undertaken a year earlier. The questions were designed to provide responses that would meet the aims and objectives of this research project. Questions related to roles and responsibilities, information management, resources (existing and required) and anticipated strategic programme.

The difficulty encountered during this phase of the research primarily related to the timing, which was only 5 months after the initial implementation. A number of local authorities were waiting for decisions to be made about potential funding from their finance departments, before making final decisions about the strategy. For these authorities decisions were unlikely to be made until 1st April 2001, which would give them 3 months to prepare their inspection strategies. Further delays were also encountered by some local authorities because the adoption of a strategy by local authorities can take up to eight weeks due to the programming of Committee or Cabinet meetings.

5.5.7 Reviewing Documentary Evidence

In May 2000 a visit was made to the DETR Head Office to review responses to various rounds of consultation (See Appendix 5). This review of documentary evidence also provided a useful insight into potential problems that have been identified by a cross section of stakeholders in relation to the regulation of contaminated land. The process undertaken simply involved the 'labourious' task of reading each response and reproducing comments that related to themes or 'meaning units' that were within the framework of the overall aims and objectives.

5.5.8 Case Studies

In September 2000 the researcher took up an appointment as Contaminated Land Officer at Sheffield City Council. This appointment has provided further empirical data presented as case studies of two areas that have be investigated with Part IIA in mind.

Yin (1989:85) states that six sources of data collection may be used for case studies, namely:

- Documentation;
- Archival records;
- Interviews;
- Direct observations;
- Participant-observation;
- Physical artifacts.

The case studies presented in this thesis have used documentary, archival records, interviews and direct observations. The purpose of the case studies within the overall research methodology is to make sense of a number of the issues that local authorities will be faced with when implementing Part IIA. Sheffield was one of the first local authorities in the country to determine a site as contaminated land. In addition Sheffield had also undertaken a major site-specific investigation of Council owned land in preparation for the

Implementation of Part IIA. These sites provide knowledge about the effectiveness of Part IIA as a framework for identifying and remediating contaminated land using a risk based framework.

> "*Case studies are particularly useful when one needs to understand a particular problem or situation in great depth and where one can identify cases rich in information - rich in the sense that a great deal can be learned from a few exemplars of the phenomenon in question.*"
> (Patton, 1998:19)

The use of case study which uses several lines of enquiry deals with the "*potential problems of construct validity ...because the multiple sources of evidence essentially provide multiple measures of the same phenomenon*" (Yin, 1989:97)

Questions of objectivity may be applied to this particular aspect of the work. Due to the nature of the work undertaken by the researcher within Sheffield City Council, it was important to remain 'neutral' in relation to the description and critical analysis. There were also ethical considerations relating to potentially confidential information.

5.5.9 The Follow-up Questionnaires

Due to the time that had elapsed between the original focus group discussion and the interview phase a short follow-up questionnaire was sent to local authorities previously involved in this research. The purpose of the follow-up questionnaires was to develop previous knowledge about implementation progress.

The YAHPAC focus group follow–up questionnaire provided a summary of the findings from the initial focus group and was sent to the local authorities that were originally involved. The questionnaire was again divided up into five topic areas to determine how local authorities had progressed. There were limitations with this approach, in that the questionnaire was quite detailed and it required a more detailed response than 'yes or no'. It could therefore take some time to complete. Other limiting factors were a short 'reply-by' date (to enable subsequent analysis prior to submitting this thesis) and a number of staff

changes. Of the nine local authorities who were sent this questionnaire only four responded.

Whilst the above response rate was disappointing there was an overlapping factor in that the same authorities which took part in the focus group discussion were all involved in the interview phase, see below. Therefore the 'missing' responses could be taken into account within this phase. Incidentally, the group involved in the focus group stage tended to be more detailed in their responses to the interview phase questionnaire.

The interview phase follow-up questionnaire was sent with a brief summary of the original findings, by email, to 59 of the local authorities in Yorkshire and Humberside and the East Midlands Regions. It was anticipated that a number of the original participants of the research may have moved on. Individual groups of authorities have a 'working group' where they discuss contaminated land issues. Email contacts were gathered with permission through the co-coordinators of individual groups of authorities e.g. YAHPAC, The Leicestershire Group, The Lincolnshire Group etc. By using this method it was hoped that the questionnaire would be delivered to the most appropriate person within each local authority. 59 out of 61 email addresses were received, of which 3 were found to be incorrect.

The questionnaire was sent out at the beginning of October 2003 with a two week response date. A reminder was then sent out which was successful in improving the response rate. The use of email was employed in an attempt to speed up the process of returns. There were some pitfalls encountered using this method, one participant had difficulty returning her questionnaire as an attachment. Another participant reported that an automated message was being generated by the researcher's computer stating that the "inbox was full", which was not the case. On further investigation this was found to relate to problems with the main computer network. Factors such as this can have a significant negative effect on response rates. In order to avoid such technical difficulties, the email which was sent to local authorities requesting assistance, also suggested that the respondent 'may wish to reply by facsimile', a fax number was provided.

Responses were received from 36 local authorities, 6 of which were not involved in the original interview phase. This represents an overall response rate of 61%. It was decided not to remove the responses of the 6 authorities not involved in the original interview phase as their responses are indicative of the current state of local authority progress.

The questionnaire was limited to 20 questions in order to encourage response rates. The questions followed a similar format to the previous semi-structured questionnaire. The disadvantage of the follow-up questionnaire was the inability to probe responses further, given the time constraints. If further time had been available, it may have been possible to telephone some of the respondents in order to try and gain further information relating to individual points. The last question gave the participant the opportunity to provide any additional relevant information which provided information of a qualitative nature.

5.6 SUMMARY

The methods adopted as part of this research enable a degree of triangulation to be achieved. It is not always appropriate to use conclusions obtained from a quantitative assessment and apply them to the issues identified as part of a qualitative study (Patton, 1989: 467). However, the results obtained from the qualitative phase can provide a wider insight into some of the reasons certain numerical values were obtained during the quantitative phase. Similarly the case studies presented enable a further description of the implementation process.

Chapter 6 provides details of the Barnsley Pilot study. Chapter 7 examines the regulation of contaminated land in Cleveland Ohio. Chapter 8 presents two case studies relating to the implementation of contaminated land in Sheffield. Chapter 9 presents the findings of the focus group discussion, questionnaire, semi-structured interview and follow-up surveys.

CHAPTER 6

THE INSPECTION STRATEGY – ONE LOCAL AUTHORITY'S MISSION INTO THE UNKNOWN

6.1 INTRODUCTION

This Chapter presents the findings of a formal collaboration with Barnsley Metropolitan Borough Council. The purpose of the collaboration was to provide the Landfill Gas and Contaminated Land Working Party with a methodology for the identification of contaminated land in accordance with the available statutory guidance (DETR, 1996). Barnsley Metropolitan Borough Council provided financial assistance during the first year of the research project. This financial contribution enabled the research project to move forward, and the assistance of the Working Party is gratefully acknowledged. The outcome of this phase of research produced a method for identifying contaminated land as well as highlighting a number of potential barriers to the effective implementation of Part IIA.

6.1.1 Background

Barnsley MBC was concerned about the potential resource implications associated with the implementation of Part IIA. In order to determine the impact of Part IIA on Barnsley MBC a pilot study project was undertaken.

No previous attempt had been made by Barnsley MBC to identify the extent of contamination in the Borough and no work had been carried out in preparation for the implementation of the Section 143 registers. At the time of the Pilot Study only a handful of local authorities had attempted to create a strategy or undertake a study to determine the impacts of Part IIA. In addition a focus group discussion undertaken as part of this research (See Chapter 9) suggested that very few local authorities had identified specific costs and resource implications in relation to Part IIA.

The pilot study was undertaken over an 18 month period in close consultation with an established Landfill Gas and Contaminated Land Working Party. The Working party was comprised of members from Planning Services,

Environmental Health, Highways and Engineering, Estates and the South Yorkshire Mining Advisory Service (SYMAS). Working Party meetings were held at various points throughout the pilot study to discuss progress and problems encountered.

The pilot study was restricted to an industrialised area of approximately four square miles. It was agreed with the Working Party that this would enable any identification methodology to be tested without involving excessive costs.

Prior to the pilot study project being undertaken, a number of key research questions were generated. These can be summarised as:

- What information exists relating to contaminated land in Barnsley MBC and where is it stored?
- How should this information be collated and stored?
- How should the information be interpreted?
- What strategy should Barnsley MBC adopt in order to deal with potential risks from contaminated land in order to fulfill its statutory obligation?
- Who should be responsible for collating and interpreting information?
- Are any additional resources required and if so at what cost?
- What is the likely cost to Barnsley MBC to undertake its statutory obligation effectively?
- What funding is available to local authorities to implement Part IIA?
- How should Barnsley MBC deal with any contaminated land in its ownership?
- How will the legislative regime interact with the planning system?

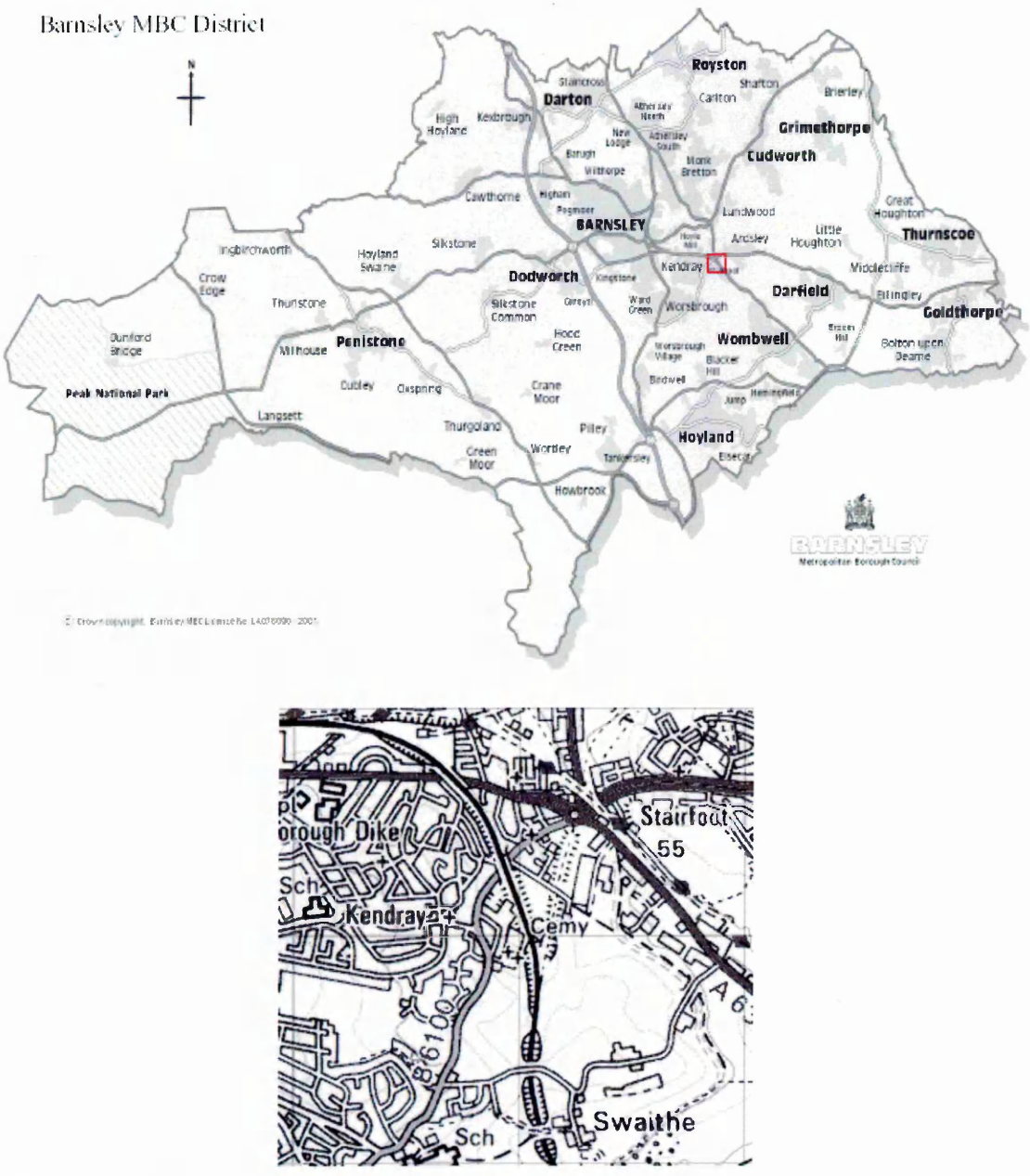
6.1.2 The Study Area

Barnsley Metropolitan Borough is situated in South Yorkshire and covers an area of 32,863 hectares. Barnsley is associated with a long tradition of coal mining and heavy industry. However, a significant proportion of the land to the west of the Borough is largely agricultural or has National Park Status. The population of Barnsley is 228,000, 90% of which live in the eastern side of the Borough (BMBC, 2002:46-47).

The pilot study looked at one of the most heavily industrialised areas of the Barnsley Borough. The study area is shown below, reproduced from FastMap. The area shows Hoyle Mill, Cundy Cross, Kendray Hospital and Stairfoot

Brickworks. The OS sheet reference numbers for the chosen areas are PLAN SE605, PLAN SE705, PLAN SE606 and PLAN SE706 at a scale of 1:2500. Figure 8 shows the area investigated as part of the study.

Figure 8 The Pilot Study Area



Source: BMBC, 2002:8 and Multimap.com

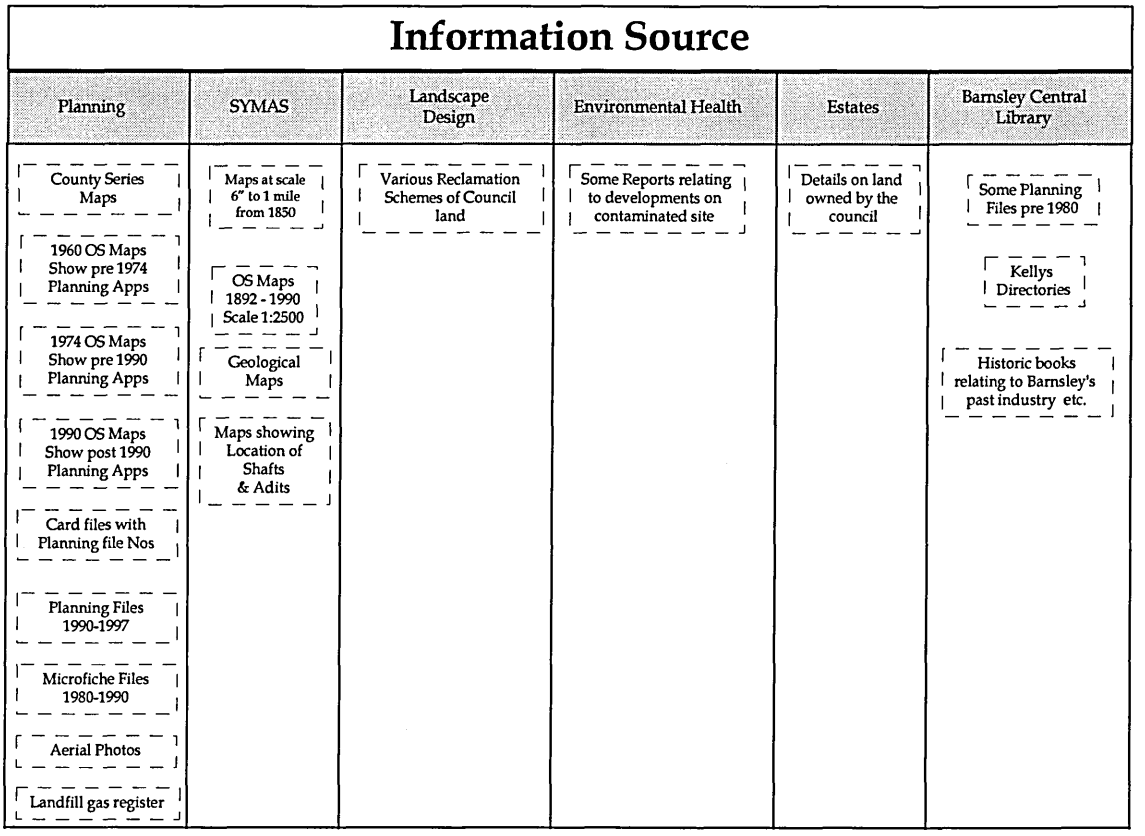
6.2 ASSESSING THE AVAILABLE INFORMATION

Barnsley MBC had made no previous attempt to collate and store information relating to contaminated land in the borough. Some local authorities in the UK did undertake some preparation for the withdrawn S.143 registers but there was never any legal obligation to do this (See Chapter Two). Information, which may be of use during the contaminated land identification process, was held in a number of different formats throughout the Council. Not all of this information was easily accessible or easy to interpret which increases the difficulty of the identification process. In order to prioritise land for further investigation, information needs to be collated and recorded so that a more detailed assessment of sites can be undertaken. Potential sources of information available to Barnsley MBC, relating to the identification of contaminated land are summarised in the list below:

- OS Maps - Current and Superseded (SYMAS, Planning Services, Specialist Companies)
- Geological Maps, Hydrogeological Records (British Geological Survey, SYMAS)
- Mining Records (British Coal)
- Mineral Extraction Records (Minerals Planning Authority)
- Town Planning Registers (Planning Services)
- Surface Water Run-Off, Licensed Waste Disposal Activities, River Details, Outfall Details (Environment Agency)
- Aerial Photographs (Aerial Photographic Libraries, Planning Services)
- Trade Directories (Kellys Etc)
- Remedial Schemes (Landscape Design)

Information was held by Planning Services, SYMAS, Environmental Health Services, Estates, Landscape Design and Barnsley Central Library. Details of the information that they hold are shown over the page in Figure 9

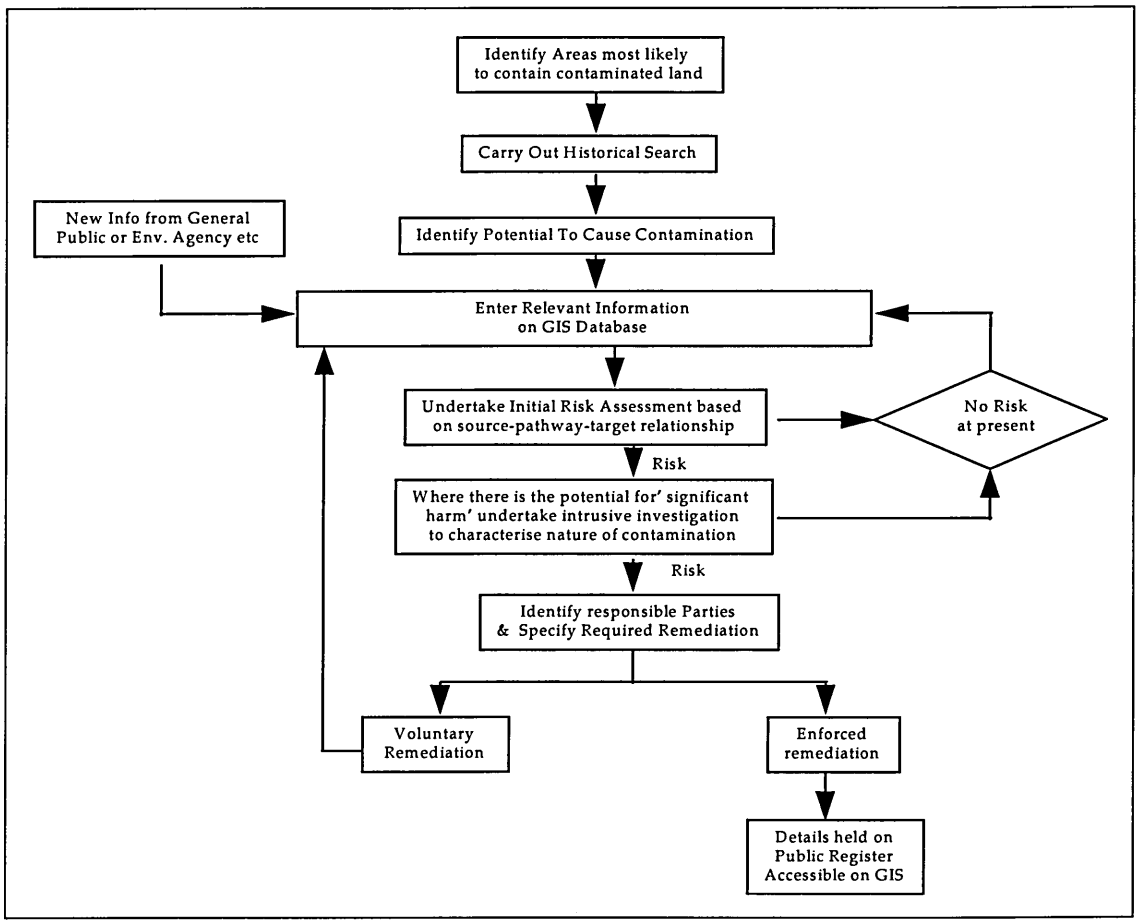
Figure 9 Information Sources within Barnsley MBC



6.3 THE MODEL IMPLEMENTATION PROCESS FOR THE PUBLISHED STRATEGY

Figure 10 shows the proposed strategy based on the Draft Statutory Guidance (DoE, 1996) which was designed to enable Barnsley MBC determine contaminated land in its area. It is a simplified model and does not show all the individual procedures. It was suggested that Barnsley's Inspection Strategy should be based on the risk management model described in this pilot study. It was noted that more information relating to the risk estimation, risk evaluation and risk control aspects of the strategy would become available when the Statutory Guidance was implemented and other local authorities started to prepare their strategies.

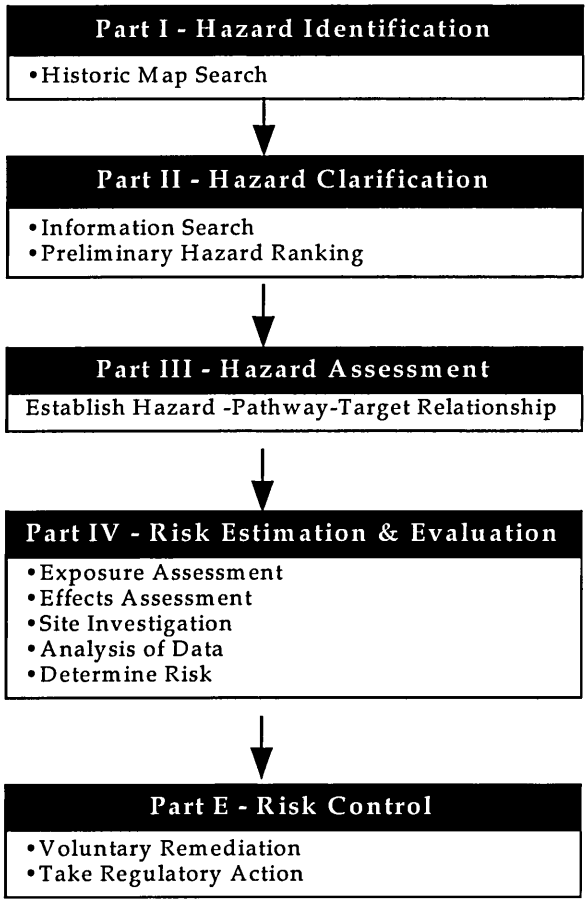
Figure 10 -Proposed Strategy



6.4 PROPOSED RISK ASSESSMENT MODEL

In order to identify potentially contaminated land, the pilot study adopted a five-stage risk assessment process adapted from the Welsh Development Agency *Manual on the Remediation of Contaminated Land* (WDA, 1993:2.3). This process is summarised in Figure 11 below.

Figure 11 The Risk Assessment Process Adopted for the Pilot Study



The first three stages were primarily concerned with establishing a pollutant linkage and the significance that can be attributed to it. The forth stage would require further assessment of potential risks and stage five relates to the management or removal of risk within the Part IIA framework.

> "*The process of risk assessment can be defined as simply 'an evaluation of the probability of harm' and in the context of contaminated land is concerned with gathering and interpreting information on the characteristics of sources, pathways and receptor (target) at a specific site and understanding the uncertainties inherent to the ensuing assessment of risk*"
> (Young, Pollard and Crowcroft,1997:11)

This source-pathway-receptor relationship is risk assessment in its most basic form (see Chapter 3). In practice, establishing a source, identifying potential pathways and targets is an onerous task for local authorities where there may many such relationships.

6.4.1 Part I - Hazard Identification

The hazard identification process was the first stage of the risk assessment exercise. The purpose of this stage was to identify any sites, which at some point in time may have been put to some potentially contaminating use. Information, which could be used during the hazard identification process, was held in a number of different formats throughout the Council. Not all of this information was easily accessible or easy to interpret. The early retirement of staff had also created a knowledge vacuum relating to the past history of a number of sites. The use of specialist companies (e.g. Landmark) to supply information relating to past use of sites was rejected at an early stage as the costs were seen to be prohibitive.

The historic map search was seen as being extremely beneficial to Planning Services in order to fulfill the requirements of Planning Policy Guidance Note 23 (PPG 23). It was therefore recommended that the initial map search would be undertaken by an additional member of staff employed on a temporary basis by Planning Services.

The historic map search would initially concentrate on the areas where contamination was most likely to be identified. It was suggested that the historic search centred on the areas of traditional past industrial activity.

The pilot study identified 42 sites within the study area that had been put to some previous use. This was then used as a basis for estimating the resource implications for Barnsley MBC.

It was estimated that it would take one officer approximately one year to undertake a review of historical maps and record previous uses on GIS. The estimated cost of this process was £15,007, using a non-qualified technical assistant to undertake the work, and excludes other costs such as information technology.

6.4.2 Part II - Hazard Clarification

Hazard clarification process aimed to characterise sites in terms of past use and try to identify exactly what the past use(s) of sites have been. It was noted that large amounts of information would need to be analysed and recorded so that sites can be prioritised for further investigation. The problem for the researcher was that all the required information is not always available. Indeed a number of members of staff had retired or left the authority and taken 'their knowledge with them'.

It was suggested that the hazard clarification process would also be undertaken by Planning Services due to the large amount of information available relating to land use and planning application in the Borough.

The aim of the hazard clarification process was to prioritise sites in terms of high, medium and low risk categories. This was undertaken by placing industries in categories according to their contaminative potential. See Figure 12 below.

Figure 12- Categorisation of Major Industrial Land Uses

CATEGORY 1	
Highly Contaminative	*Contamination*
Hazardous Waste treatment	O/I
Bulk organic chemicals manufacture	O
Bulk inorganic manufacture	I
Fine chemicals manufacture	O
Coal gasification/carbonisation	O/I
landfill and other waste treatment/disposal	O/I
Steelworks	O/I
Lead metal ore processing and refining	I
Oil refining and petrochemicals production	O/I
Pesticides manufacture	O
Asbestos and asbestos products manufacture	I
Scrap yards	O/I
Pharmaceuticals	O

CATEGORY 2	
Moderately contaminative	*Contamination*
Drum and tank cleaning/recycling	O
Fertilizer manufacture	I
Non-ferrous metal ore mining	I
Wood preservatives production and timber treatment	O
Docks	I
Electric/electrical equipment manufacture	O
Mechanical engineering	O/I
Garages/filling stations	O
Mineral processing (bricks, cement, tarmac etc)	I
Power stations	I
Sewage treatment works	I
Shipbuilding/shipbreaking	O/I
Textile production and dyeing	O
Tyre manufacture and other rubber processing	O/I
Metal (other than iron or lead) processing/refining	I
pulp and paper manufacture	O
paint and ink manufacture	O/I
Electroplating and other metal finishing	O/I
Precious metals recovery	I
Foundries	I
Tanneries	O/I

CATEGORY 3	
Slightly Contaminative	*Contamination*
Timber products manufacture	O
Animal processing works	O
Glass manufacture	I
Road haulage yards	O
Building trades products manufacture	I
Printing Works	O
Research laboratories	O
airports and airfields	O
Vehicle manufacture	O
Railway yards/sidings	O
Toiletries, detergents, disinfectants etc manufacture	O
Electricity sub-stations	O
Dry cleaners	O

CATEGORY 4	
Low Concentration	*Contamination*
Food preparation/processing (inc. brewing)	I
Distilleries	I
Railway tracks	I
Agriculture	None
Oil Shale and coal mining	I

Notes to above:

1. 'O' signifies organic contamination. 'I' signifies inorganic contamination

- This categorisation it is for illustrative purposes. It will give a broad indication only of whether the business concerned involves a contaminative use and, if so, the degree of seriousness of that contaminative use.

2. Whether a business falls within a particular category will depend on a number of factors, such as:
   a) Whether the business use of the site has given rise to contamination;
   b) The period of time for which the site has been used for the business purpose;
   c) The overall sensitivity of the site with respect to its broader environmental setting;
   d) Assessment of the extent to which the business follows good environmental practice and management controls;
   e) The extent of the manufacturing or processing activity which is carried on by the business at the site;
   f) Assessment of the influence of the underlying geology and its hydrogeological characteristics.

Source: NFHA, 1995:46

The researcher could then identify whether the site was potentially high, medium or low risk. Following this process a decision could be taken as to whether any further investigation was needed.

6.4.3 Part III - Hazard Assessment

The hazard identification process and the hazard clarification process were concerned with identifying the possibility that a site is likely to contain some hazardous substance. The hazard assessment exercise aimed to identify the possibility that a pollutant linkage exists. That is, a potential source has been identified and a target could perhaps be adversely affected due to a possible pathway. A difficulty arises due to the fact that each site has its own unique characteristics, all of which have to be assessed in order to determine the probability that the site may be contaminated.

The hazard assessment exercise can be used to prioritise sites for further investigation. An additional scoring system was used to identify sites which have the potential to present a significant risk. This was similar to that suggested by CLR 6 *Prioritisation and Categorisation Procedure for Sites Which May be Contaminated* (DoE, 1995). Unlike the preliminary hazard ranking, which was based solely on use, this additional scoring system takes into account the potential for there to be targets which may be affected via a plausible pathway by a known contaminant. This is an extremely difficult task as the probability of a significant risk may depend on a number of different factors such as the host medium (soil, rocks, groundwater), the proximity to potential targets and the length of time people are exposed to the hazard.

The first stage of the hazard assessment exercise involved starting with those sites which were ranked as Category One (high risk) sites during the hazard clarification stage. If the researcher was able to identify the previous use(s) then it was necessary to try and characterise the contaminants that are associated with that industry e.g. by reference to the DoE list of industry profiles. Having characterised the contaminants, it would then be necessary to identify whether any targets are likely to be affected by them. Were the contaminants likely to be mobile (e.g. solvents, from a paint factory) or static

(such as lead or copper from smelting works)? Mobile contaminants may be able to reach groundwater aquifers.

The important factor in the hazard assessment process (in relation to Part IIA) is that there needs to be a source-pathway-target relationship. If any of these elements do not exist or are unlikely to exist then a site cannot be determined as contaminated.

The pilot study suggested that land should be prioritised such that:

- *sites which have no potential pathway or target are ranked 'not significant';*
- *sites where there is a hazard and a target but no pathway should be ranked 'potentially significant' and*
- *those sites that have a hazard, pathway, receptor relationship should be ranked 'significant'. (Knight, 1999)*

Those sites that are significant should then be investigated further in the risk estimation stage. Sites ranked potentially significant should be kept under review and altered in the light of new information. This is similar to the approach adopted by the US EPA in relation to sites on the CERCLIS list of potential Superfund Sites (See Chapter 7). Sites that are identified as having a significant possibility of being contaminated should then be subjected to site-specific assessment.

The pilot study estimated that there might be up to 125 sites in the Barnsley Borough that may require a hazard assessment, which, it was estimated, would take approximately five years to complete effectively. It was suggested that this should be undertaken by Environmental Health Services due to the expertise that exists relating to the control of harmful substances. It was also suggested that an additional member of staff should be employed in Environmental Health to deal specifically with contaminated land.

6.4.4 Part IV - Risk Estimation and Evaluation

This particular phase of the research study was based on a subjective assessment of the Barnsley area in terms of known geography and population etc. It was estimated that of the 125 sites which were the subject of a source-pathway-receptor analysis that perhaps 20 sites may still have the possibility of causing significant harm.

The Barnsley study referred to work by Harris, Herbert and Smith (1995) in relation to risk estimation and evaluation. The CLEA Model introduced in April 2002 develops the risk estimation and evaluation principles by quantifying the risks at each stage (See Chapter 3).

Harris, Herbert and Smith (1995) state that risk estimation involves:

"detailed consideration of hazards, pathways and targets to establish:

- *the nature of the exposure of the target to the hazard*
- *the nature of the effects resulting from defined levels of exposure*
- *the probability (expressed in either qualitative or quantitative terms) that adverse effects (harm) will occur at defined levels of exposure*

Risk evaluation involves the consideration of:

- *the qualitative or quantitative statements about risk derived from the risk estimation process*
- *other site-specific factors which may affect the risks - e.g. sea-level rise, propensity to flooding, construction activity such as piling*
- *the uncertainties in the risk estimates*
- *the costs and benefits of taking action to control or reduce unacceptable risks*
- *the social pressures for action*
- *the significance and acceptability of the risks in relation to current and future land use"*

In cases where Barnsley MBC decided to undertake a site investigation it was recommended that a consultant should be employed. Barnsley MBC would be able to specify what they required to be carried out and would be able to use the conclusions of the report to determine whether any form of risk control would be required. This would then reduce the involvement of the Contaminated Land Officer and enable other sites to be assessed.

6.4.5 Part V - Risk Control

The final part of the risk management process applied to the Barnsley Pilot study was that of 'risk control'. In circumstances where the assessment indicated that the risks associated with contamination are unacceptably high, it was suggested that Barnsley MBC would be required to act in accordance with the statutory guidance.

6.5 STORING INFORMATION

As part of the pilot study process, consideration was given to the way in which information could be stored. It was noted that Geographical Information Systems (GIS) are very useful for storing such information and are used by a number of local authorities in the UK for storing information relating to the abandoned S.143 registers of potentially contaminated land. There are a number of advantages of using GIS to store information relating to contaminated land. These include:

- *Sites can easily be located through the computer by means of different search mediums*
- *Different databases relating to one site can be stored on different overlays*
- *Sites can be colour coded*
- *Access can be restricted to specific users*
- *Some potential pathways and targets can be identified*
- *Can enable the risk management process to be undertaken effectively*
- *Can be used as part of the planning process to determine applications in accordance with PPG 23*
- *Can be used to store the Public Register of contaminated land which each local authority is required to keep as part of their statutory duties*
- *Information can be networked between departments*

(Knight, 1999)

The above list is not exhaustive but it illustrates some of the advantages that a GIS may have over a paper based record of contaminated sites. There are some disadvantages, which need to be highlighted. These include the need for some training by the staff who will be using the system and the need for new hardware.

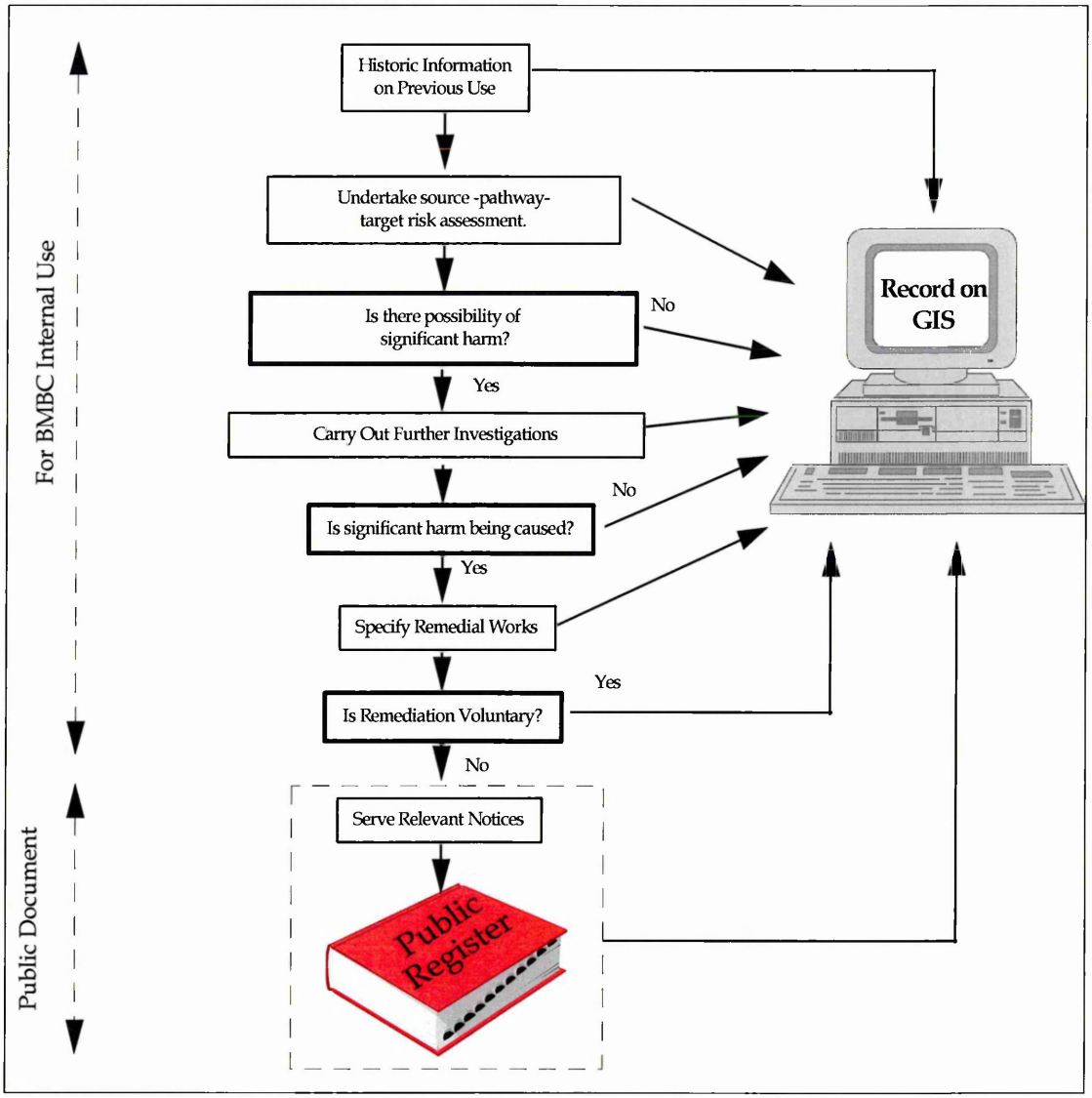
Two GIS software packages were looked at as part of the pilot study, FastMap and MapInfo. The two systems were already used within the authority but a large amount of data and expertise already existed in relation to FastMap. After assessing their strengths and weaknesses the decision was taken to use FastMap and a template was created for storing information. By using the GIS the risk presented by each site can be shown visually by colour coding each overlay. Using the security functions built into the GIS, access can be limited to certain users if required. This will enable the Council to keep the Public Register of contaminated land on the GIS. Access can be restricted so that only sites that have been identified as being contaminated are shown on the Public Register.

Part IIA requires local authorities to inspect their areas for the purpose of identifying contaminated land. Where contaminated land is identified information relating to the site needs to be kept on a Public Register of contaminated land. There is no legal obligation to store any information on sites which were identified as having a previous use but were later found not to be presenting a significant risk. An additional advantage of storing such information is that it can be used as part of the planning process to determine planning applications in accordance with guidance contained within PPG 23, and in cases where information is provided by external sources it will enable the Council to verify the information received

6.5.1 Access to Information

Consideration was given to the accessibility of information held on the GIS, which will run alongside, but is separate to, the public register of contaminated land. Information held on the GIS will be subject to the Environmental Information Regulations 1992 and will need to be available on request. This may include information such as material prepared for the withdrawn S.143 registers as well as information collated and stored as part of the Councils identification process in fulfilling its statutory obligation under Part IIA. It was suggested that charging for access to the information may possibly reduce the amount of information requested.

Figure 13 - The Relationship of the GIS with the Public Register



(Knight, 1999:61)

Figure 13 shows the relationship of the GIS with the public register. The diagram shows that all information relating to previously used sites is recorded on the GIS including the public register. However, the intention is that only information relating to enforced remediation be available to the public. Access by the general public to the other information held on the internal GIS will need careful monitoring so that information provided does not unfairly prejudice any local company or landowner.

6.6 THE PROPOSED TIMESCALE

The pilot study provided Barnsley MBC with details of the information that exists relating to contaminated land within the authority and gave some indication of the likely cost and timescales involved. Funding from Central Government is likely to have the greatest impact on the authority's ability to undertake the task effectively.

It was suggested that the timescale of the proposed strategy would depend upon resources provided by central government. The Pilot Study identified that it will take approximately 156 days to undertake the historical map search and 397 days to analyse relevant information and undertake preliminary risk assessment. It was estimated that 217 days would be required to undertake a hazard assessment, followed by 60 days to undertake the risk estimation and evaluation of each of the most significantly contaminated sites. Figure 14 shows the proposed timescale for implementing the suggested strategy.

Figure 14 Proposed Timetable

	Number of Years to Complete									
	1	2	3	4	5	6	7	8	9	10
Undertake Historic Search	◄	►								
GIS set-up	◄	►								
Risk Assessment	◄									►
Determination of Contamination land		◄								►
Specify remediation & Enforcement Action		◄								►

(Knight, 1999:17)

6.7 RESOURCE IMPLICATIONS

Based on the proposed timetable and proposed assessment methodology the following estimates of costs were identified:

Hazard Identification	£15,007
Hazard Clarification	£30,014
Hazard Assessment, Risk Estimation, Evaluation & Control	£25,000pa
Preparing the Strategy Document	£2,000
IT Requirements	£8,250
Training	£2000pa

The overall cost to Barnsley MBC to implement the legislation:

1st Year	£50,275	
2nd Year	£42,007	
3rd Year	£42,007	
4th Year & thereafter	£26,500	(Knight, 1999:74)

The estimated costs related purely to revenue funding that would be required to implement the legislation. It was recognised that there may be other significant costs associated with undertaking site investigations and remediation works and that this would probably have to be funded using Supplementary Credit Approval (SCA).

6.8 THE PUBLISHED STRATEGY

Shortly after the proposed implementation of Part IIA the Environmental Health department had a significant restructure in terms of staff. This led to a significant delay in publishing an adopted strategy. The final strategy was adopted in February 2002, seven months after the published deadline in the statutory guidance.

The Planning Department held a significant amount of the resources with which to start the identification process. It was decided that, rather than employ one

person on a temporary basis to complete the task of identifying potentially contaminated land as suggested in the Pilot Study, that consultants could undertake this exercise. The advantage of this approach was that it removes some of the 'on-costs' associated with such an appointment and there was 'guaranteed delivery' of the required information within a specified time frame.

The Council decided to purchase a 'bespoke' product that had been developed by BGS and Lovell Johns which effectively would provide the Environmental Health Department with the required information to move onto the hazard assessment (intrusive investigation) stage of the implementation process. According to Barnsley's published Inspection Strategy the prioritisation exercise should have been completed by July 2002.

The strategy suggests that the detailed data assessments of sites will be completed by January 2006, this may include a limited amount of soil sampling. The strategy states that where further information is required, a detailed investigation will be carried out. No timescale is given for this part of the process.

The methodology adopted for prioritising land is similar in design to that proposed as part of the pilot study. However, the identified cost for undertaking the work internally was similar to that for the bespoke product, which was a significant contributing factor.

6.8.1 The Current Position

The research undertaken as part of the follow – up questionnaire described in Chapter Nine suggest that the proposed targets will not be met and that a review of the strategy has led to significant alterations to the published strategy. It is now estimated that, without additional resources for new staff, the detailed inspection stage will not be completed until 2010.

6.9 CONCLUSIONS

The pilot study outlined a strategy that could be used by Barnsley MBC in order to fulfill the requirements of Part IIA. Barnsley MBC chose to 'buy-in' a bespoke prioritisation package for commercial reasons, yet the principles adopted in the Pilot Study framework are still valid and could potentially be of value to other local authorities who have yet to develop a method for prioritising potentially contaminated land.

The Pilot Study also highlighted a number of practical difficulties of actually implementing the strategy.

The Pilot Study identified that in many cases there was an information vacuum within the local authority which could lead to sites being ignored due to time constraints and insufficient resources. The problem with inadequate historical searches is the potential for information to be misinterpreted which may lead to sites being blighted.

The costs of undertaking investigations are prohibitive and are likely to be met with lengthy delays whilst decisions are taken as to what is undertaken and at what cost. (This was noted in relation to Supplementary Credit Approval and the length of time it took from applying to DETR to finally getting permission from the relevant local authority committee to spend the finance).

Geographical Information Systems were found to be very useful for storing information relating to past use and the potential to be contaminated. Information has to be stored correctly so that it cannot be misinterpreted by external users. The benefit of using such a system is that certain information can be restricted if necessary.

The experience of the pilot study suggested that the costs and resource implications of undertaking this statutory obligation would lead to very few sites appearing on remediation registers held in accordance with S.78P of the Environmental Protection Act 1990.

The potential cost to the local authority should a legal challenge be made to any of its decisions was a particular concern, as was the potential for appropriate persons to claim 'hardship' and leave the local authority with the responsibility for remediation.

Progress with the published Inspection Strategy has been delayed due to insufficient resources and this is likely to have a significant 'knock-on' effect on the timetable for detailed inspection.

CHAPTER 7

A STUDY EXAMINING POTENTIAL APPLICATIONS OF BROWNFIELD[1] POLICY IN CLEVELAND, OHIO TO THE REGULATION OF CONTAMINATED LAND IN ENGLAND

7.1 INTRODUCTION

On completion of the Barnsley Pilot Study a research opportunity arose that would involve examining brownfield policy in Cleveland, Ohio. USA. Due to the delay in implementing Part IIA and the generally slow progress of local authorities in preparing for its implementation, it was decided that the 'fieldtrip' could be accommodated within the overall research programme. The purpose of the field trip was to compare policy approaches in relation to the regulation and redevelopment of contaminated land in Cleveland, OH and England.

A research proposal was put to the Royal Institution of Chartered Surveyors Education Trust Fund in order to obtain partial funding for the comparative study. The RICS granted an award that enabled the research to proceed and their contribution to this part of the research is gratefully acknowledged. The comparative study was primarily based in Cleveland, Ohio with the guidance and support of Dr. Robert Simons of the Levin College of Urban Affairs at Cleveland State University. Interviews were held with local, regional and federal regulators and relevant economic regeneration co-coordinators. Site visits were made to a number of key sites remediated as part of the brownfield regeneration initiative in Cleveland.

This Chapter provides a brief overview of the legislative framework in the USA and the way in which it has been applied in Cleveland, OH. The Chapter describes the approach adopted by Ohio State in 1999 to encourage redevelopment of brownfield land by voluntary means. Finally, the Chapter assesses the policy approach to the regulation and redevelopment of brownfield

[1] The term 'Brownfield' in the USA implies that there is the potential for contamination, whereas it is used more widely in the UK to describe any site where there has been some previous use (Syms and Simons, 1999:121). Throughout this Chapter the term 'brownfield' is used to mean 'land potentially affected by contamination'. Any references to 'contaminated land' relate to the statutory definition provided in Part IIA of the EPA 1990 and supporting guidance (DETR, 2000a).

land in Cleveland and the potential areas of policy that could be beneficial in England.

7.2 THE AIM AND OBJECTIVES OF THE CLEVELAND STUDY

The aim of the this part of the research was to evaluate systems used in Cleveland relating to the identification and remediation of brownfields and establish whether these could be applied to the regulation of contaminated land in England. The objectives of the research were largely determined as a result of the Pilot Study undertaken in collaboration with Barnsley MBC (described in Chapter Six). The objectives of the Cleveland research were to:

- Critically assess how contaminated land is regulated in Cleveland
- Determine what strategies, if any, exist at local level to identify and remediate contaminated land
- Identify how information is stored and used
- Establish the extent of the contamination problem in Cleveland
- Determine who is responsible for funding remediation
- Critically assess the available fiscal incentives to developers involved in regenerating brownfields.

7.2.1 Research Methods Applicable to this Study

Due to the limited three week research period and the distances required to travel within Ohio State, the research was restricted to five interviews, four site visits and a review of available information.

With the assistance of Dr. Robert Simons, a number of key stakeholders were identified who could assist this research. Five face-to-face interviews were held with local and regional EPA staff and relevant economic regeneration co-coordinators from Cleveland City and Cuyahoga County.

Site visits were made to a number of key sites remediated as part of the brownfield regeneration initiative in Cleveland. Dr Robert Simons was also able to provide a considerable amount of useful information based on his own research experience.

Research questions were generated that would enable the aim and objectives to be achieved (the questionnaires are reproduced in Appendix 4).

7.3 THE REGULATION OF BROWNFIELDS

The term brownfields in the US generally means a site that has been occupied by some previous use that may have left some residual contamination in the ground (Simons, 1999:verbal communication). Fields, 1995 defines brownfields as:

> *"abandoned, idled or underused industrial and commercial facility where expansion or redevelopment is complicated by real or perceived environmental contamination" (Fields,1995)*

This is the definition that has also been adopted by the EPA Region 5 (Simons, 1998:30). There are slight differences in the definition of brownfield used in different Regions and can make comparisons difficult.

There are two regulatory regimes designed to deal with the most hazardous sites in the US. The first is the Resource Conservation and Recovery Act (RCRA) introduced in 1976. RCRA enabled regulators and the general public to require cleanup at sites that "may present an imminent and substantial endangerment to health or the environment" or where hazardous wastes are released in violation of a permit or other requirement of RCRA." (Simons:1998:19).

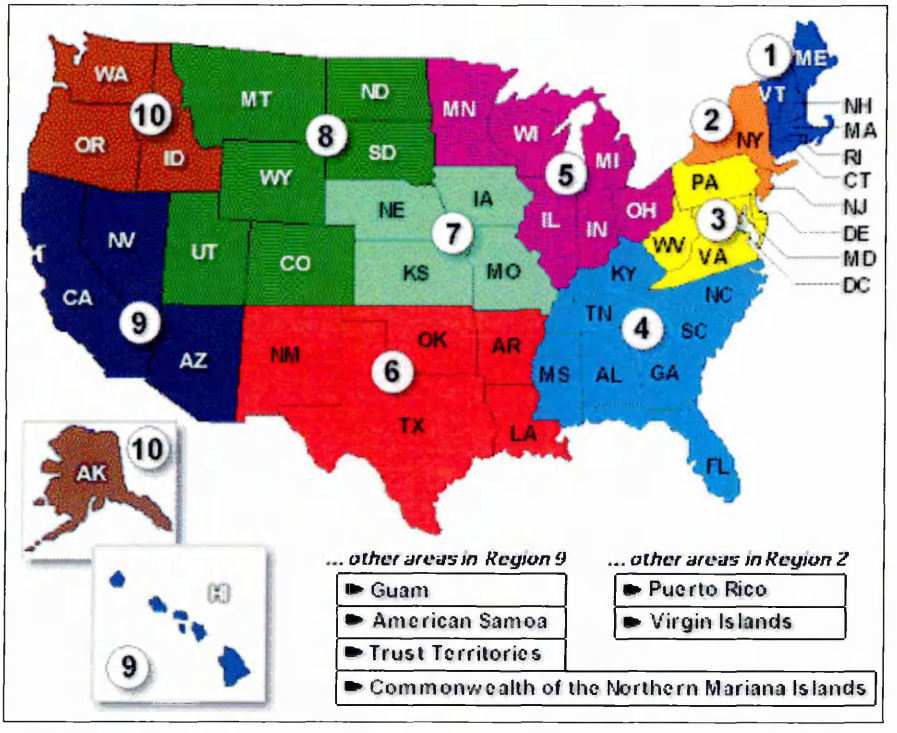
This legislation also required landowners or operators and, in cases of an "imminent hazard", all other persons responsible to undertake the clean-up or reimburse the state or U.S. EPA for expenses associated with cleaning up that facility (Simons: 1998:19).

The second regime was passed by US congress in 1980 known as The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLA was the response of the US government to several environmental disasters such as Love Canal in New York State; Stringfellow Acid Pits in California; Valley of Drums in Kentucky among others. CERCLA establishes a retrospective liability scheme for remediation of virtually all

contaminated properties (Simons, 1998:19). Unlike RCRA, liability for clean-up is not limited to sites containing an "imminent hazard" but extends to "all sites contaminated with even modest amounts of one or more hazardous substances". (Simons,1998:19). Superfund sites are sites that could fall within the statutory definition of contaminated land within the Part IIA regime. Many Superfund sites could also be similar in characteristics to those identified as 'special sites' and regulated by the Environment Agency in the UK.

Both RCRA and CERCLA legislation were put in place to deal with potential public health and environmental threats and were backed up with powerful resource recovery mechanisms. The US Environmental Protection Agency (USEPA) based in Washington is responsible for administering the National Priorities List (NPL) and issuing guidance to the 10 Regional Environmental Protection Agencies who provide advice and support to the individual State EPA. The regional EPAs have a substantial amount of autonomy, to a point. Figure 15 shows the administrative areas of the 10 regional EPAs.

Figure 15 The Administrative Areas of the 10 Regional EPAs



Source: http://www.epa.gov/superfund/sites/npl/npl.htm

The brownfields that exist in the US generally exclude Superfund sites from a practical redevelopment perspective. . As Simons, (1998) states:

> *"Realistically, very few, if any, of the sites are viable for development in the near term, because they entail perceived public health problems, excessive clean-up costs, long time frames, and strict, joint and several liability to anyone in the chain of title. Clean-up of a few select sites has been completed..." (Simons, 1998:31)*

7.3.1 Land Regulated under the Superfund System

In England, Part IIA places local authorities under a duty to proactively inspect their areas for the purposes of identifying contaminated land. The pilot study undertaken by Barnsley Metropolitan Borough Council revealed that information held by them may not be sufficient to provide the required confidence to enable it to designate a site as having the potential to be contaminated land. Other outcomes of the pilot study identified insufficient resources to enable the local authority to effectively identify contaminated land and a potential 'fear factor' of a legal challenge from persons identified by the authority to be 'appropriate persons'.

The Barnsley pilot study and an earlier focus group discussion suggested that local authorities may already be able to point to those sites which they suspect may be contaminated without having to undertake a comprehensive and costly inspection of their areas. As one Officer stated at the focus group discussion the purpose of Part IIA is:

> *"To go looking for trouble rather than waiting for it to happen".*

The regulatory system in the US is not pro-active in requiring the EPA to go out and inspect their region and there is no requirement of similar studies by local Authorities (Interview with staff from EPA Region 5, July 1999).

> *"What we have done, is known as a site control attention. Look at it and if it looks like it has got problems that we think are significant we will take an action against them. Those are the ones we give in to our reinforcement programme and everybody else, who we don't go after, is all the folks who can go through the voluntary programme." (Interview with Staff from State EPA, July 1999).*

Through the interview process it became clear that most of the sites that could fall into the Superfund category (National Priority List) have already been

identified. At the time of this research approximately 1,300 known sites were on the National Priority List (NPL). In contrast there were only 59 sites determined as contaminated land in England in July 2003 (EA, 2003b). NPL sites are usually sites that were already known about, prior to the introduction of CERCLA or are ones that have been brought to the attention of the USEPA through public concern. There are three mechanisms by which sites can be placed on the National Priority List. These are shown in Box 8 below.

Box 8 The Three Mechanisms by Which Sites can be Placed on the NPL

1. Using the EPA's Hazard Ranking System
2. A top priority site in a state or territory, regardless of score
3. In circumstances where all the following criteria are met:
   - The Agency for Toxic Substances and Disease Registry (ATSDR) of the U.S. Public Health Service has issued a health advisory that recommends removing people from the site;
   - EPA determines the site poses a significant threat to public health; and
   - EPA anticipates it will be more cost-effective to use its remedial authority (available only at NPL sites) rather than to use its emergency removal authority to respond to the site"

One of the stated objectives of this aspect of the research was to examine how contaminated land was identified in Cleveland. It was established that there is a reactive approach to the identification of these sites. Most sites are known or brought to the attention of regulators rather than undertaking historic land searches. As part of the Part IIA process local authorities are required to prioritise land in their area for further inspection (DETR, 2000a:para 3.3:pg 21). The UK government did not introduce a standard model for prioritising potentially contaminated land. Chapter 4 evaluated different prioritisation models developed commercially which have been used by local authorities in order to implement their inspection strategies.

The USEPA has a risk prioritisation tool known as the Hazard Ranking System (HRS) which requires a site to score 28.5 in order to become a Superfund site. This scoring system takes into account all known hazards, potential targets and potential pathways, and is especially sensitive to groundwater contamination where drinking water wells are nearby. If the score doesn't reach 28.5 then the site is not a Superfund site. Sites that have been assessed using the Hazard Ranking System and do not exceed the required score are placed on a NFA (no further action) list. At this stage review criteria are built into the system so that,

should the situation change and new receptors are introduced or pathways emerge, the total score may change and that site may become a Superfund site.

The points scoring system may be valuable to local authorities in England that are looking for a mechanism through which they can prioritise sites for further inspection. Chapter 4 of this thesis describes some of the available methodologies that have been adopted by different local authorities. However there are considerable differences in approaches that could lead to inconsistency in the way sites are prioritised by different local authorities. In addition, there are resource implications for individual local authorities having to develop their own methodology rather than being able to adopt one that has been developed by central government.

A standardised prioritisation system that develops the ideas in CLR 6 *Prioritisation and Categorisation Procedure for Sites which may be* Contaminated (DoE, 1995) would promote consistency among local authorities. The Government commissioned research to develop such a scheme, but the results of this research were never published. (Interview with Malcolm Lowe, July 2000). Local authorities in England will want to have the confidence to state that a site is likely to be contaminated before investigations are carried out so as to avoid lengthy court battles. Setting a standard scoring system would also assist local authorities in providing answers to information requests regarding whether the local authority intends taking any further action under Part IIA.

Sites that get less than 28.5 are "delisted" (in theory) but in actuality are placed on the US EPA NFRAP (no further remedial action planned) list. The fact that sites are placed on this list should provide developers and investors with sufficient confidence that they require. There is evidence that in the Ohio programme the NFRAP letter has provided the required 'comfort' to lenders who were concerned about potential future liabilities (Based on information from Interview with Staff from State EPA, July 1999).

The USEPA also has a list of sites that are awaiting evaluation. These are known as CERCLIS sites. CERCLIS is the Comprehensive Environmental Response, Compensation, and Liability Information System. CERCLIS sites are evaluated using the Hazard Ranking System. The HRS was used to identify whether land in the Totley case study presented in Chapter 8 would have been determined as a contaminated land. The overall score based on available information was 33.34 (the calculations are shown in Appendix 10). Therefore, using the model would have identified the site as a potentially contaminated site. The model is currently heavily weighted towards groundwater pollution, however it is likely that with some minor modifications it could be used in the England to provide further comfort to local authorities in determining whether any further action is required. It is suggested that further research could be undertaken to develop the HRS for the UK situation.

The Superfund Programme conducts five-year Reviews at sites where, after clean-up activities, some levels of contaminants were left on site such that this limits the use of the site. The US EPA will also review sites where clean-up activity is still in process after five years. Local authorities should be able to regulate land use through the development control process.

7.3.2 Assessment Action on Superfund sites

After a site is listed on the NPL, a remedial investigation and feasibility study is undertaken.

The purpose of the investigation is to:

- characterise site conditions;
- determine the nature of the waste;
- assess risk to human health and the environment; and
- conduct treatability testing to evaluate the potential performance and cost of the treatment technologies that are being considered.

The feasibility study examines alternative methods of remediation.

> *"The remedial investigation and feasibility study are conducted concurrently — data collected in the RI influence the development of remedial alternatives in the FS, which in turn affect the data needs and scope of treatability studies and additional field investigations. This phased approach encourages the continual scoping of the site characterisation effort, which minimises the collection of unnecessary data and maximises data quality." (http://www.epa.gov/superfund/whatissf/sfproces/rifs.htm)*

The remedial investigation and feasibility study process includes the following phases:

- Scoping;
- Site Characterisation;
- Development and Screening of Alternatives;
- Treatability Investigations; and
- Detailed Analysis.

> *"A baseline risk assessment is developed to identify the existing or potential risks that may be posed to human health and the environment by the site. Because this assessment identifies the primary health and environmental threats at the site, it also provides valuable input to the development and evaluation of alternatives during the feasibility study."*
> *(http://www.epa.gov/superfund/whatissf/sfproces/rifs.htm)*

The development of an appropriate remediation programme requires the:

- Identification of remedial action objectives;
- Identification of potential treatment, resource recovery, and containment technologies that will satisfy these objectives;
- screening of alternative remediation technologies in terms of their effectiveness, implementability, and cost.

(source:http://www.epa.gov/superfund/whatissf/sfproces/rifs.htm)

The US methodology has many similarities to that used in the UK for assessing the overall risk from a potentially hazardous site. There may be additional benefits in exploring the methodology used to assess the feasibility of schemes in relation to Part IIA. This is beyond the scope of this research.

7.3.3 Liability

RCRA and CERCLA legislation were put in place to deal with potential public health and environmental threats and were backed up with powerful resource recovery mechanisms. Due to lower risk thresholds originally adopted in the United States the costs of cleaning up contaminated land could be huge. For example:

> *$80 million has been spent to clean up three Superfund sites in Bullit County, Kentucky. The Superfund has contributed $10 million to the clean up of the three sites at the 23-acre Valley of the Drums, a 57-acre Tri-City Disposal in Shepherdsville and a 120-acre Smith's Farm Landfill. The remaining $70 million came from fines on those who operated the sites.*
> (The Courier Journal Louisville Kentucky. Wednesday March 26th 2003 (http://www.courier-journal.com/nabes/2003/03/26/H1-epa26bc-4039.html))

CERCLA liability is retroactive, which means that persons may be held liable for contamination that occurred prior to the introduction of the CERCLA. Unlike the UK situation, liability under Section 107 cannot be transferred to another partner, even by contractual agreement (Section 107(e)).

CERCLA Section 107(a) identifies the persons that can be liable for the costs of responding to a release, or the threat of a release, of hazardous substances. The types of parties that can be held liable are:

- *The current owners or operators of the facility or vessel*
- *Former owners or operators of the facility or vessel, if they owned the property at the time of disposal*
- *Those who arranged for treatment or disposal of hazardous substances at a facility*
- *Transporters of hazardous substances who selected the disposal site. Anyone involved in the management of hazardous substances, from production to final disposal and beyond, can be held liable.*

Two types of liability imposed under CERCLA are shown in Box 9.

Box 9 Types of Liability under CERCLA

Strict Liability

Is the assessment of legal responsibility without regard to fault or diligence. To hold a party strictly liable, the government must prove only that the potentially responsible person (PRP) meets the statutory definition of liability, regardless of the party's intent, knowledge, or purpose. The government does not have to prove that the PRP acted in a negligent manner; the government needs only prove that the PRP is in one of the four statutory classes of liable parties found in Section 107, and that the release, or threat of a release, of a hazardous substance occurred at the facility.

Joint and Several Liability

Means that if the harm at the site is indivisible, such as unmarked, intermingled drums or commingled wastes, any and every PRP at the site may be liable for the entire cleanup cost, regardless of the amount of waste the PRP actually contributed to the site. If the harm at the site is divisible, then the burden of apportioning the harm is on the PRPs. The PRP who pays all or part of the costs of a site cleanup, however, does have the right to sue other parties that may have been responsible, and to force them to contribute funds (CERCLA Section 113(f)). In resolving contribution claims, the courts may allocate response costs among liable parties using equitable factors as appropriate. In general, EPA's practice is to attempt to identify and notify all PRPs and issue orders or litigate against as many contributors as practicable.

http://www.epa.gov/superfund/contacts/sfhotline/liab.txt

The joint and several liability approach was one that was favoured by one local authority during the interview phase of this research.

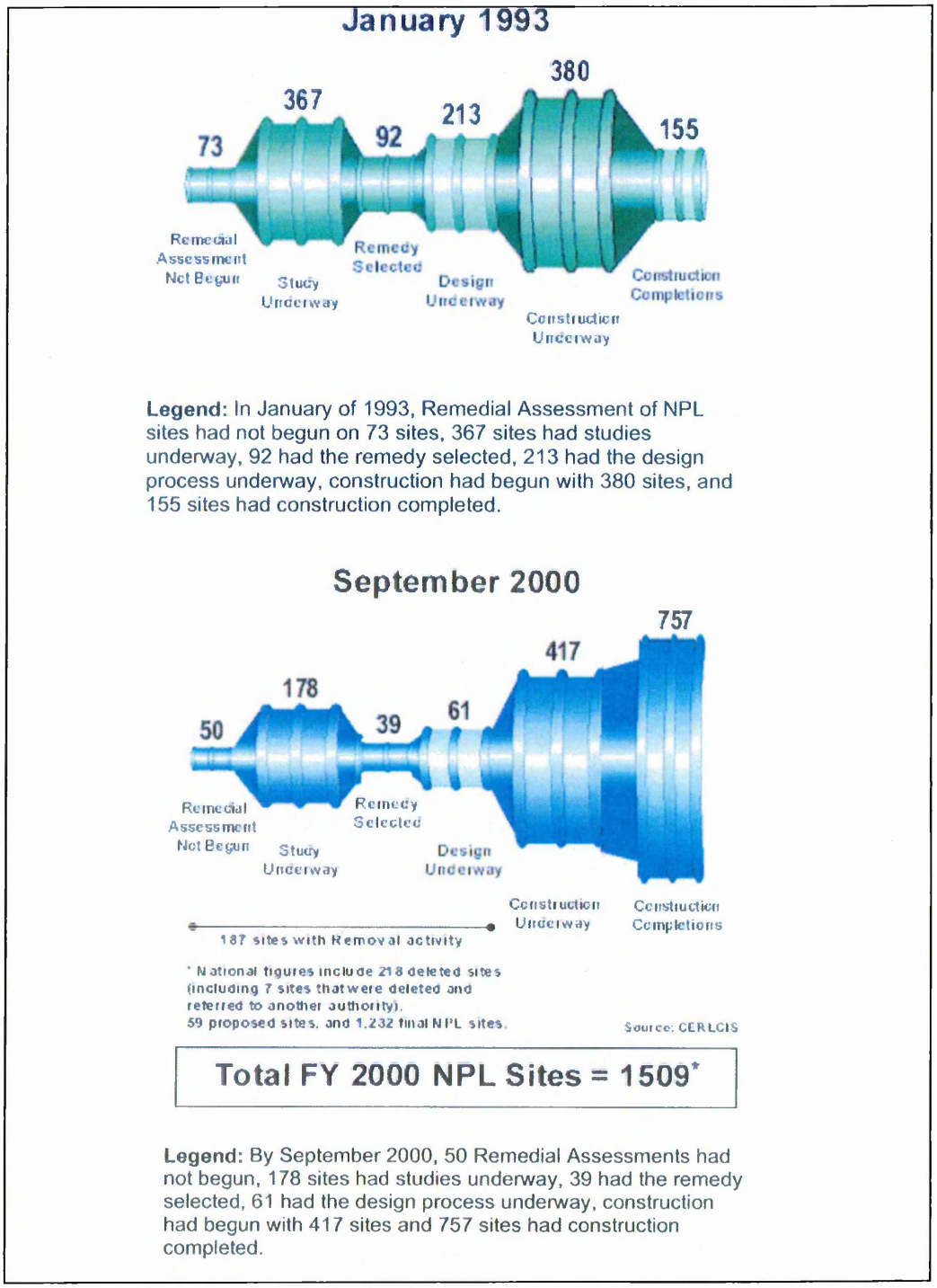
> *"It is very bureaucratic. Trying to notify uncle Tom Cobleigh and all and identify who may be liable, because they have 'caused' or 'knowingly permitted' the contamination. Particularly where you have got a site which has had several owners....Some people have suggested that it would be a lot easier just to go for the owner of the site or the current occupier of the site and then if they feel aggrieved by that then they can at least sue or get damages to recover their costs."*
> (Local Authority Environmental Health Officer, 2000)

This would then take the potential burden of apportioning liability under the statutory guidance away from local authorities. The concern obviously being that local authorities are fearful of long and complex legal battles that produce a significant strain on local authority resources. One consideration for the UK government may be expanding the availability of the Supplementary Credit Approval scheme or similar to enable local authorities to use the capital expenditure budget to employ suitably qualified lawyers.

7.3.4 Superfund Progress

Figure 16 shows the six stages involved in the Superfund clean-up process and the significant progress that has been made by the US EPA during the seven years between September 2000 and January 1993.

Figure 16 The Progress and Process of the Superfund Clean-up programme Between January 1993 and September 2000



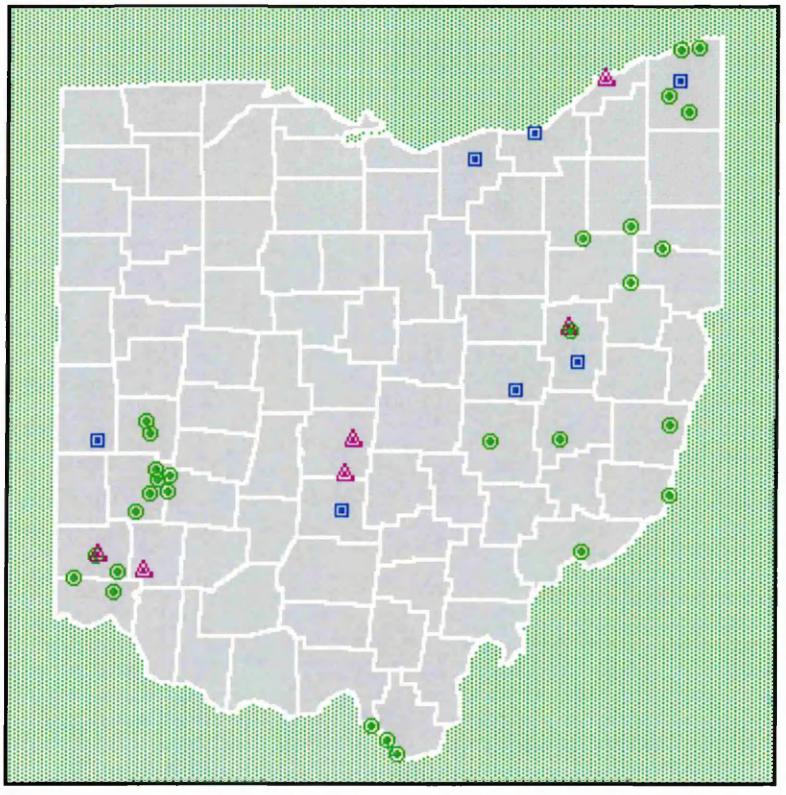
http://www.epa.gov/superfund/action/process/mgmtrpt.htm

Figure 16 shows that progress in dealing with sites that require remediation assessment action and remediation action has increased significantly. This may potentially be a future outcome of the contaminated land identification and remediation in England. However, the results of the interviews and questionnaires described in Chapter 9 suggest that progress may remain slow but constant for the foreseeable future, without the provision of extra resources.

7.3.5 Superfund in Cleveland, OHIO

There have been 42 sites placed on the CERCLIS list in Ohio. These are shown in Figure 17 below.

Figure 17 Map Showing CERCLIS NPL Sites in Ohio State.



Map Key: Proposed: 6 Final: 29 Deleted: 7

Source: http://www.epa.gov/superfund/sites/npl/oh.htm

There is only one site in Cleveland that has been placed on the National Priorities List. The site was owned by *Chemicals and Minerals Reclamation, Inc.* and covers a 3/4 acre area located on the north side of Cleveland, Ohio, on the flood plain of the Cuyahoga River. The owner of the site had collected and

stored wastes in vats and barrels, which contained miscellaneous wastes including flammable and non-flammable solvents, paints, tar, grease, and resins. These storage operations continued until July 2, 1980, when a fire occurred at the warehouse on the site. Box 10 describes the remediation process.

Box 10 The Remediation Process at a Superfund Site in Cleveland, Ohio.

"In 1981, 2,000 containers, ranging in size from 5 to 55 gallons, of flammable and non-flammable solvents (both chlorinated and non-chlorinated), paints, tar, grease, resins, and other miscellaneous wastes were removed. The buildings on site were demolished and the contaminated soil was removed to a licensed landfill.

A Consent Decree (CD) was signed in 1987, between the U.S. EPA and all potential responsible parties (PRPs) to recover more than 85 percent of the U.S. EPA's clean-up costs. The site was deleted from the NPL in December 30, 1982".

Source: http://www.epa.gov/R5Super/npl/ohio/OHD980614549.htm

7.4 THE VOLUNTARY ACTION PROGRAMME (VAP)

The CERCLA legislation was designed to deal with the most polluted sites that pose a significant risk to human health. There are a considerable amount of sites that are polluted but are not so contaminated that they fall into the Superfund category. In the UK such sites would be identified through the planning system, and conditions will be attached to the planning permission detailing what the developer is required to undertake.

One of the reasons for the introduction of Part IIA was to increase awareness and consistency amongst local authorities in the way in which development situations are handled. Some authorities were seen as being too prescriptive in their requirements whilst others were requiring little, or no, work to be carried out, even if the sites were very similar (Syms, 1997:21).

A system to promote the reuse of brownfield land has been set up in Ohio known as the Voluntary Action Programme (VAP). Other States have similar programmes called Voluntary Clean-up programme (VCP's). At the time of writing over 40 US states have some form of VCP, the purpose of which is to encourage the re-use of brownfield land by volunteers. The VAP's are usually regulated by the State EPA in the case of Cleveland, the Ohio EPA. As well as

the NFA letter the voluntary action programme also entitles the developer for limited financial assistance and some programmes offer low interest loans, tax breaks (tax credits) long payback periods etc. (See some of the recommendations of the urban task force, UK).

The planning system in the US is fairly weak and pro-business (Simons, 1999, verbal communication). There are considerable amounts of vacant and underused land. The City of Cleveland, OH is trying to identify sites that would be suitable for redevelopment. The problem for cities such as Cleveland is that new industry and commercial shopping centres wish to be placed outside the inner city of Cleveland and within minutes of a major roadway. This creates a situation where the skilled workforce moves to the outskirts to be near the jobs, but leaves the less skilled, poorer inhabitants in the centre. This then has leads to associated social problems etc. However, the City of Cleveland and nearby areas have a number of successful programmes that have gone through the Voluntary Action Programme including *Northcliffe* in Brooklyn, Ohio, and *Collingwood Yards* in Cleveland. (Conversation with Robert Simons, July 1999)

7.4.1 Land Assembly

Greg Myers of Cleveland City Council Economic Regeneration Department stated that two approaches had been adopted for site assembly and development. The first approach, during the late 1980s and early 1990s involved the City identifying viable sites. The City Council acquired the sites, contracted out the remediation work, had the remediation certified by an environmental firm and got a 'clean' piece of property. The City Council would then market the property themselves. Generally, individual companies would then come in and develop the site. That approach did not result in a very quick turnover of their property, or a very quick return on the investment. The second approach involved the Council assembling property, doing the clean up and simultaneously sending out requests for proposals from developers to bid on purchasing their properties. The Council then took a more active role in developing it as private retail or office parks.

In Cleveland, there has been a great effort to assemble properties that do not have many major obstacles, such as contamination. However, the problem sites are where there has been a lot of heavy industry and there are some fears by developers and financiers about potential costs in avoiding any possible future liabilities.

> *"There was an example where the state took on a remediation project in the City, of a former heavy manufacturing plant, and it sunk about 38 million dollars in to the clean-up of the site. It is just sitting vacant right now....it's vacant land. Situations like that tend to make developers and investors fearful of certain things that they may find in those heavy industrial sites."* (Interview with Greg Myers Cleveland City Council, 1999).

The ability to promote the regeneration of such sites can be assisted by instruments such as the 'no further action letter', or the 'covenant not to sue'. (See Section: Promoting Consistency Among Developers and Regulators later in this Chapter). Financial incentives can also assist in regenerating 'problem' sites.

7.4.2 Financial Incentives

Cleveland City Council identifies strategic areas of land and then offers financial incentives to developers to look at those sites as part of the voluntary action programme. The Economic Development Office (Part of the Cleveland Local Authority) is assembling suitable brownfield sites, but at locations outside the centre. This is largely due to the infrastructure problems.

Despite the lack of strict planning controls there are other incentives to redevelop brownfield sites, which may be job creation, political, improve urban setting, pride in area. The financial incentives include low interest loans, especially for groundwater pollution remediation, long paybacks etc. These appear to have been successful in regenerating areas and creating new employment.

> *In the late 70's and early 80's a lot of funding from federal grants went to local communities in the United States to establish loan pools where they could use them to help redevelopment projects in urban areas and communities. These were essentially services which were able to provide loans and create a revolving pool of resources. This funding regime is known as the "Community Development Block Grant" (Based on Information from Greg Myers, Cleveland City Council, July 1999)*

In 1997 former President Bill Clinton signed the Taxpayer Relief Act which incorporated tax incentives to stimulate the clean up and redevelopment of brownfield land. The purpose of the Brownfield Tax Incentive was to bring back sites into productive use, revitilise neighbourhoods and create new jobs. The UK introduced the Contaminated Land Tax Credit in 2001 along with other fiscal measures aimed at regenerating deprived and neglected areas. The extent to which this has been successful has yet to be evaluated.

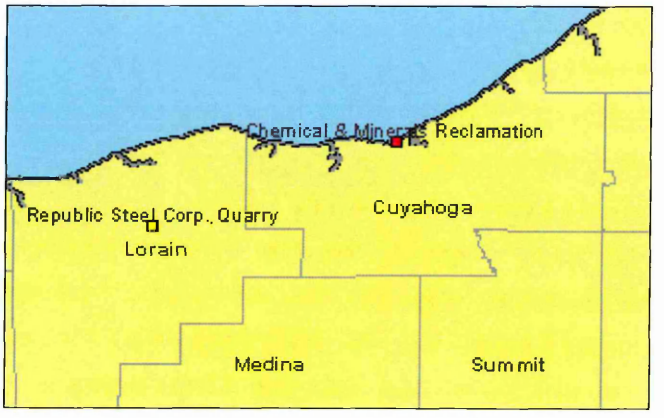
In addition to funding that had been provided via the federal government, the City of Cleveland had a unique source of funding. Following a successful lawsuit, the City Council won a settlement fee of approximately $50million. The Mayor of Cleveland decided that, rather than put the money into the Council's general fund, it would use the finance to overcome some of the brownfield issues faced by the City.

"We really set aside that pool of money as brownfield loan programme where we could make loans at very attractive rates. Because it was the City's own money, if we wanted to use it as a grant form we could. If we wanted to make it as zero percent interest rate we would just recoup the principal and do whatever is necessary to be very creative. That finance has been very effective in overcoming some of the obstacles brownfields pose to us, and helped us to assemble land, particularly for business parks." *(Interview with Greg Myers, Cleveland City Council, 1999).*

At the present time, local authorities in the UK do not have the same freedoms as those in the US to offer such benefits. There may be considerable benefits, to local authorities or Regional Development Agencies which have difficulty in attracting developers into a proposed regeneration area, of providing a 'public loan' rather than the 'gap funding' regime that is available at present (See Chapter 4). This could take a similar form to SCA funding and be administered by the Regional Development Agencies. Loans could be offered over 25 years at low interest in order to promote regeneration. Such a process would need to be agreed within Europe as the low interest loans may be seen as an unfair subsidy.

In Cleveland and surrounding areas financial assistance may also be available from the County Cuyahoga Planning Commission. The area covered by the Planning Commission is shown in Figure18.

Figure 18 Map Showing Cuyahoga County



http://map3.epa.gov/enviromapper/index.html

The Planning Commission in Cuyahoga County was responsible for administering a Brownfields Pilot Grant of nearly $200,000. According to Virginia Aveni, the Programme Manager, the Brownfield Pilot has been successful in a number of ways. The Brownfield Pilot in the City of Cleveland brought in $2.6 million in state funding and $3 million in private investment. The programme enabled the assessment and satisfactory remediation of approximately 7 acres of land, which were then developed by business ventures. (Based on information obtained during an interview with Virginia Aveni and Dan Meanie of Cuyahoga County Planning Commission, August 1999)

7.5 AVAILABILITY OF INFORMATION

There is a much greater amount of information publicly available in the US than is the case in the UK. Much of this information is easily accessible through obtaining the local property assessor's parcel number or via the internet. Many of the known contaminated sites are listed through individual states EPAs' websites. There is currently an issue of litigation relating to the information held about one site, which will be of interest for local authorities worried about what

information to hold on GIS within their authority. The view taken in the US is that:

> *"All the information held on the databases would have to be made available under the Freedom of Information Act to anybody who requests that information, all that is happening is that we are making it easier for those who need that information to obtain it." (Interview with Staff from State EPA, July 1999)*

Many city authorities have their own websites relating to the past use of sites, lots of which may have EPA listed sites as well as other important real estate information. The information held on these sites are caveated so that the user is made fully aware of the source of the information and the date when the page was last updated.

7.6 CLEAN-UP STANDARDS

Ohio State created a new set of regulations in December 1996 that allow remediation to 'background' or risk-based levels, whichever are higher, based on certain site specific criteria (Simons, 1998:113).

"Water quality is a big issue because of the high water table in many parts of the state, and different sets of criteria apply to the use of potable and non-potable groundwater" *(Simons, 1998:113)*

The Ohio EPA has developed an Urban Groundwater designation, which means that areas where groundwater may be slightly contaminated – but all the drinking water is drawn from another location (in this case lake Erie). Then that groundwater can be ignored for the purpose of risk assessment. There are four classifications of groundwater designation. There are different standards for different contaminants relating to residential, commercial and industrial end uses (Simons, 1998:113) however, where contamination is to be left *in-situ* additional monitoring may be required.

> *"Encapsulation is permitted on sites with historically contaminated fill, but capped sites may involve more monitoring, a restriction filed with the County as part of the deed to the property, and being the subject of state disclosure regulations" (Simons, 1998:113)*

In the UK costs and benefits are factors in the risk management process. In certain cases where the cost of treating certain groundwater contamination exceeds the benefits then it may be left *in-situ.* However, in development

situations there may be future liability issues should more severe groundwater pollution occur at a later date.

7.7 PROMOTING CONSISTENCY AMONG DEVELOPERS AND REGULATORS

An experienced and diligent developer would probably undertake a site investigation at an early stage in order to discover possible contamination problems. The developer will employ a consultant who will oversee the site investigation and remediation and when the development is concluded will write a post remediation validation survey. This will then be forwarded to the local authority that will acknowledge receipt. There is usually no letter from the authority stating that they accept the work was undertaken in accordance with current guidance. Braithwaite (1997) has suggested that developers and their consultants should be required to sign a notice stating that they have acted in accordance with an agreed remediation proposal. The suggested wording is reproduced below in Box 11.

Box 11. Braithwaite's (1997) Suggestion for a Certification Statement in the UK

This is to certify, that the scheme of decontamination and reclamation at the site known as.....was carried out between the dates of.....and.....and was completed in accordance with best practice and to the specification detailed in the document reference.....entitled.....which was designed to afford protection from (gaseous) and other chemical contaminants on site.

Signed this.....day of.....1997

.....

Consulting Engineer Supervising the works

(Typed name, company, address and position)

.....

For Developer

(Typed name, company, address and position)

However, Braithwaite (2003b) at a recent seminar held at Staffordshire July, 2003 stated that

> *"very few developers would sign up to this agreement as they had no duty to do so".(Baithwaite 2003b)*

In Ohio there is an innovative State programme whereby a new development on a brownfield site is overseen by a certified (by the Ohio EPA) private consultant. The consultant oversees the whole remediation process and at the end issues what is known as a No Further Action (NFA) letter. There are also other letters which can be issued by the State EPA such as a covenant not to sue (CNTS).

The State EPA audits one out of four of the private investigations to identify problems in terms of methodology, work undertaken etc. There are very strict guidelines, which the consultants are required to follow, and there is little room for abuse, otherwise the consultants are liable to have their certification revoked. The consultants have to pay a large fee to remain certified although they can recoup this through fees to their client.

> *"To ensure quality outcomes, OEPA certifies consultants based on academic credentials, work experience, and ethical criteria."* (Simons,1998:113)

The client benefits, as it is a 'one stop shop' where he only has to deal with his consultant thus removing a considerable amount of indecision and bureaucracy. The client also receives a letter at the end of the day stating that no further action is required. This information could then be provided to potential purchasers in the UK, e.g. as part of a Land Condition Record, which may increase confidence in previously used sites.

Research undertaken by Syms, 1997 revealed that house builders were reluctant to be up front with potential purchasers about the past use of sites (Syms,1997a:21). The ability to provide a no further action letter issued by a certified consultant would perhaps increase confidence amongst purchasers. This is an option that the UK government should seriously consider especially in relation to the present policy of requiring 60% of new development to be on brownfield sites.

Some developers may choose not to go through the VAP in order to save time. Such a decision means that all contaminated soils have to be removed, which is expensive but means that a NFA letter is not required. In certain circumstances it may be the financiers and not the regulators who require such action to be undertaken.

7.8 SUMMARY

The aim of the this part of the research was to evaluate systems used in Cleveland relating to the identification and remediation of brownfields and establish whether these could be applied to the regulation of contaminated land in England. This case study has evaluated a different system of regulation and identified areas which could be beneficial to the regulation of contaminated land in England.

The fieldtrip identified both similarities and differences in the way in which contaminated land is regulated. It is argued that Superfund sites are similar in nature to sites that may be determined as Contaminated Land by Part IIA. These are sites that, in their current use, have the potential to cause harm to human health or groundwater. In the US there is no requirement of any government department to proactively identify potentially hazardous sites. Superfund sites are placed on a 'waiting list' and are then prioritised using the hazard ranking system. Evidence from the literature review and fieldwork undertaken suggests that a significant amount of time has been spent by local authorities in England assessing different prioritisation packages, which then has a knock-on effect in terms of overall progress.

This case study has applied the Hazard Ranking System to the Totley case study presented in Chapter 8. The overall score based on available information was 33.34 (the calculations are shown in Appendix 10). Therefore, using the model would have identified the site as a potentially contaminated site. The model is currently heavily weighted towards groundwater pollution, however it is likely that with some minor modifications it could be used in the England to provide further comfort to local authorities in determining whether any further

action is required. It is suggested that further research could be undertaken to develop the HRS for the UK situation.

Liability issues are a major consideration in relation to Superfund and Brownfield sites. The Strict, Joint and Several liability means that anyone who has at any time had some involvement with the site may be liable for some part of the remediation costs. The one major difference between the US and the UK system is that of identifying responsibility for the costs of remediation. In the US it is possible to require one liable party to fund the cost of remediation. If they are aggrieved because they feel that there are other parties responsible for the pollution, they can then 'sue' for costs. The policy approach in the UK was to avoid the potential for lengthy legal cases, which may cost industry millions of pounds.

One of the problems for local authorities in England, is that the time required to identify all responsible parties for the remediation of a site and the potential costs of a legal challenge may slow progress in relation to the determination of a number of sites. It is interesting that to date the majority of sites that have been determined are Council owned sites or sites where there is no apparent responsible party and the costs of remediation would fall to the 'innocent owner'. A potential option to remove this concern would be a provision within the SCA (or future replacement) scheme to enable local authorities to apply for capital expenditure to undertake such legal cases. In any case where there are legal issues to be addressed the cost and resource implications will ultimately end up being funded by the public purse.

Environmental information is much more freely available in the US than it is in the UK. For example information about all the Superfund sites are available on the US EPA website, no such information yet exists on the Environment Agency Website.

Cleveland had only one Superfund site that was identified at the outset of the CERCLA regime. This site was remediated and dealt with by the US EPA and costs were recovered from the operator. Historically, Cleveland used to have a number of heavy industrial processes. Some of these have successfully been

redeveloped such as Collingwood Yard, but there are many inner-city areas that would not be redeveloped without funding from City, County or State Grants. Liability is also an issue with many developers and financiers. The issuing of "no further action letters" and "covenants not to sue" has provided the required confidence to enable developments to proceed. Local authorities in England should not be burdened with the responsibility for 'signing-off' remediation schemes. Rather than a formal signing-off process a post remediation verification report should be required on every scheme involving potentially contaminated land. A suggestion could be to include specific requirements in the proposed replacement of PPG 23 relating to the specific requirements of the verification report.

It is the author's opinion that the process by which consultants are required to meet certain specified criteria and be accredited by the State EPA would be beneficial in the UK. This would provide the required confidence by local authorities that site investigations have been undertaken in accordance with best practice.

The approach adopted in Ohio was 'hands -on'. The City Council, County Planning Commission and the State EPA work with developers to try and achieve the remediation of land assembled for redevelopment. Regulators in England have often been seen by developers as barriers to development, rather than enablers (Syms, 1997a:21)

Recent data suggests that that there has been a considerable increase in the number of Superfund sites that have now been assessed and remediated. It is not yet clear whether such an increase will be seen in England.

CHAPTER 8

PART IIA: THE APPLICATION OF RISK ASSESSMENT

8.1 INTRODUCTION

This Chapter presents two case studies that describe alternative methods for determining the potential risk from land affected by the presence of contamination. The case studies have very different histories and the potential for harm was assessed in very different ways. The case studies highlight the practical difficulties faced by one local authority in determining the *significant possibility of significant harm,* given the guidance that was available at the time.

Both of the case studies referred to are in Sheffield and were identified and investigated prior to the adoption of the local authority's Contaminated Land Inspection Strategy.

> *"The Council decided to investigate these sites early as it had identified elevated levels of a number of contaminants and was aware of its new responsibilities under Part IIA – we also wanted to get in there early before the SCA money to deal with these sites ran out" (SCC, 2000).*

The critical receptor in relation to both the case studies is human health, with a limited amount of investigation examining the potential for pollution of controlled waters.

Very few practical examples of action or possible action in relation to Part IIA are in the public domain, and this largely remains the case as identified in Chapter 1. This Chapter describes the process adopted by Sheffield City Council in relation to Part IIA and identifies a number of possible barriers that will have an impact on the overall future effectiveness of its implementation.

The information provided in the case studies has been identified from a number of different sources. These included face-to-face discussion with relevant stakeholders involved, documentary evidence and observation in the field gained following the author's employment at Sheffield City Council.

8.2 CASE STUDY 1: MANOR PARK, SHEFFIELD.

This case study looks at an area of land owned by Sheffield City Council that was first considered as potentially contaminated land in March 1999. The area was identified as a result of two small, unrelated site investigations undertaken by the Council. Both these investigations recorded a significant amount of fill material and elevated concentrations of arsenic, lead, mercury, PAH and Phenols. Desk studies revealed that the area had historically been used for mining, quarrying and later in-filled with unrecorded waste.

The exact area of in-filling was unknown by the Sheffield City Council in an area which is currently occupied for a mixture of uses, residential, public open space, school and a proposed allotment area. The area investigated was approximately 700 hectares and comprised a number of sensitive uses. The site investigation incorporated a significant amount of soil sampling, which was analysed using a statistical kriging method. Risk based screening levels were then used to determine the potential for significant harm.

The area discussed in this case study encompasses the grounds of a school, a large housing estate and several areas of public open space. The residential estate comprises 984 two and three bedroomed, traditionally built houses with large gardens, constructed in the 1920s and 1960s. At the time of the study, approximately 388 of these properties were in owner occupation with the remainder being owned by the Council.

Figure 19. 1893 OS County Series Map Showing Manor Case Study Area

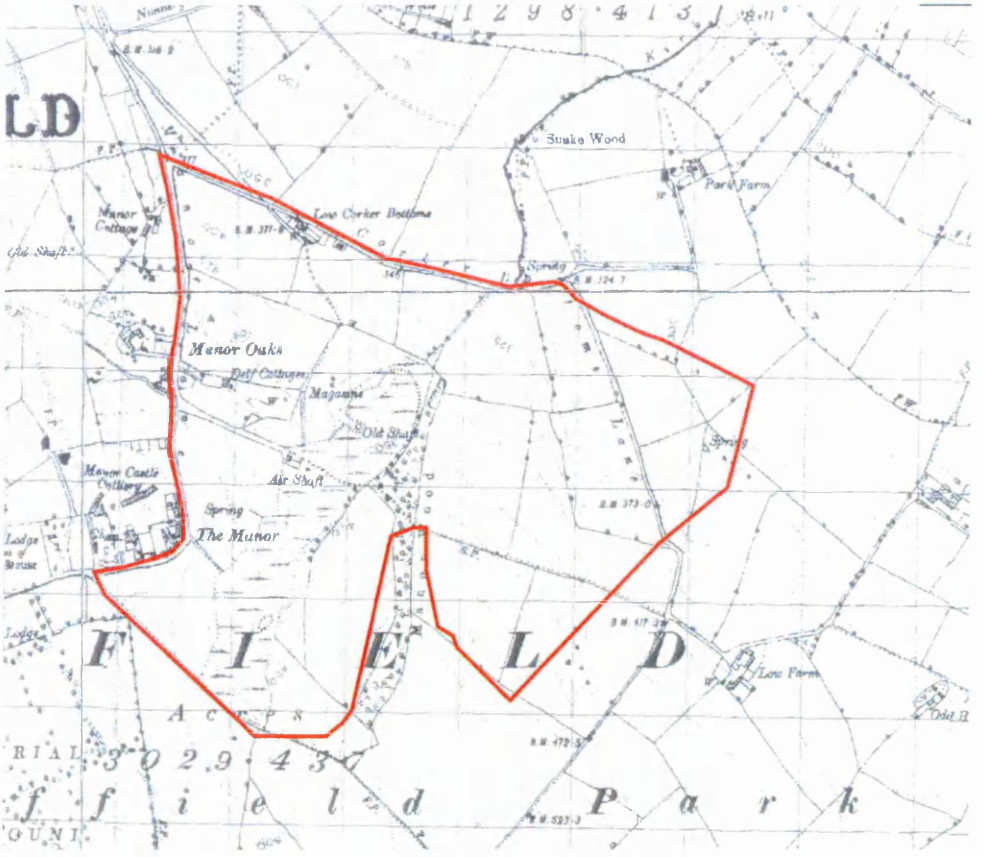


Figure 20 1903 OS County Series Map Showing Manor Case Study Area

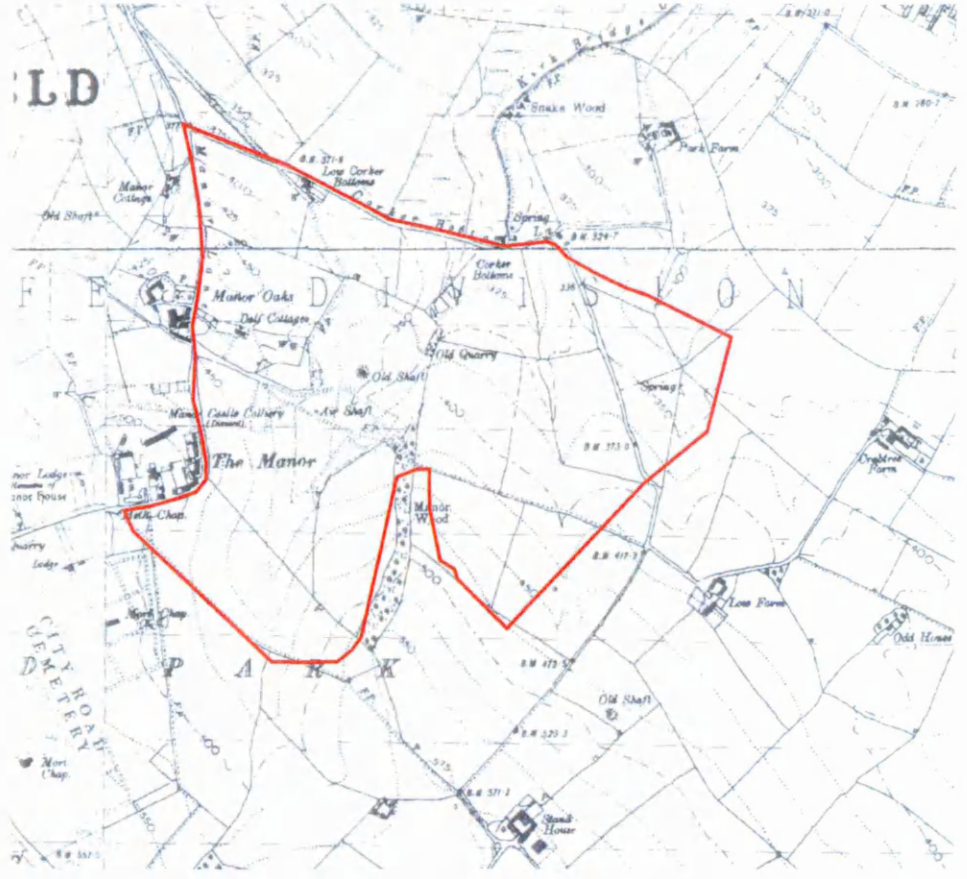


Figure 21 1930 OS County Series Map Showing Manor Case Study Area

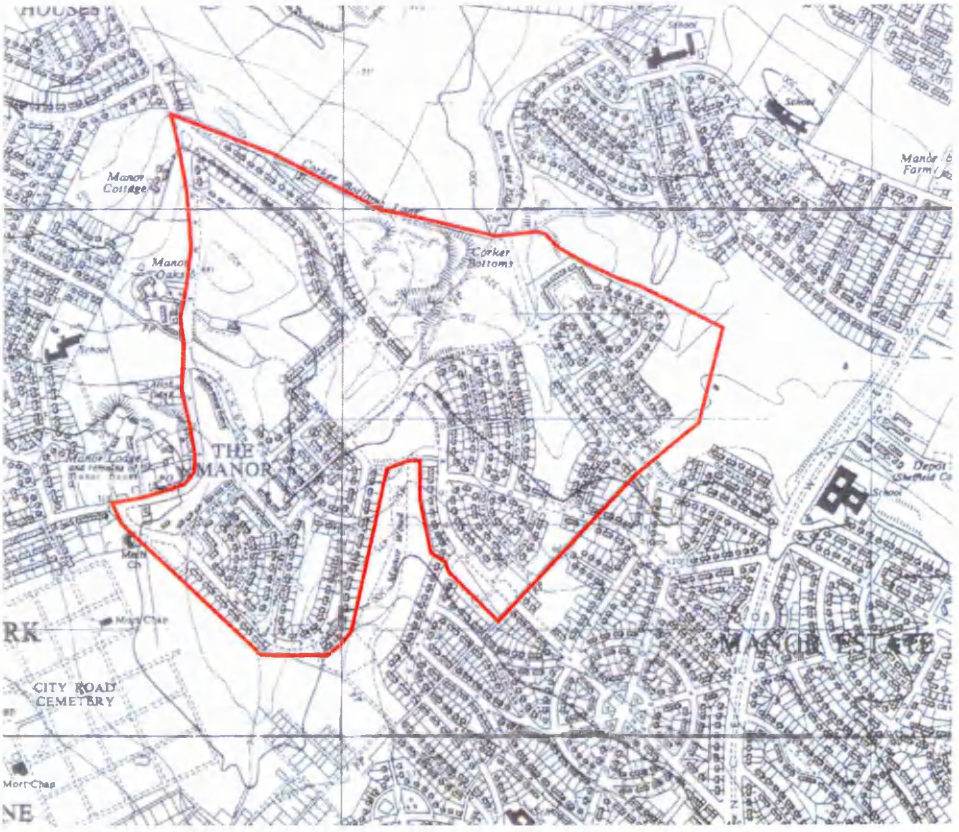


Figure 22 1964. OS County Series Map Showing Manor Case Study Area

Figure 23 Manor Case Study Area - Present

Source: Sheffield City Council Aerial Photograph 2002

The desk studies undertaken by the Council revealed that, prior to development, a number of collieries had operated in the area, dating back to the late 1700s. After these pits were closed in the late 1850s, the land was subjected to high levels of tipping, although it was not clear from historical records the nature of materials deposited and who had been responsible for depositing this waste.

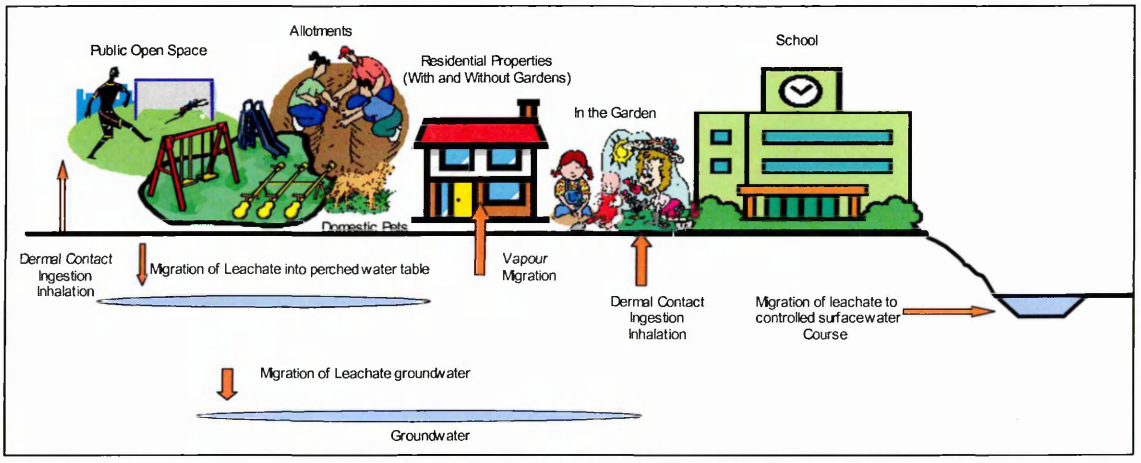
The historical use of the area suggested that there was a potential for contamination to have been brought onto the site to fill areas that had been quarried. The area was developed for housing between 1928 and 1968, which could have also made use of imported fill materials for levelling purposes. Sheffield was heavily bombed during World War II and it is likely that this area may have been used as suitable location for disposing of the remains of damaged property and other waste.

The site investigations were undertaken by the local authority's Geotechnical Department in the autumn of 1998. The first investigation was undertaken prior to the potential relocation of an allotment site to the area shown as Corker Bottoms on figures 21,22 & 23. The investigation included 28 trial pits. Chemical analysis was undertaken on 45 soil samples excavated during this investigation and the results revealed 'pockets' of elevated levels of lead and arsenic.

At the same time the local authority were undertaking investigative works to discover the causes of subsidence at a property on the estate. During the intrusive phase of this investigation, made ground was encountered to a depth of 9.0m. The made ground comprised of a loose red to black, silty sand and gravel with occasional waste (glass, pottery, brick, slate), coal and ash. The made ground was underlain by natural soft to firm orange/grey sandy clay within the first six trial pits/probe holes excavated. Chemical analysis was not undertaken during this investigation but it was concluded that such analysis would be required to assess the chemical composition of the made ground.

The results of the above investigations indicated to the local authority that within this area there were a number of potential pollutant linkages. Figure 24 provides a graphical representation of these possible pollutant linkages

Figure 24 Manor Conceptual Model



The local authority was unable to identify any Class A person who had knowingly permitted any contaminative substances to be in the land. This was largely attributed to the dates of the tipping, which was undertaken prior to the Control of Pollution Act 1974 and was never recorded by the Council as having been an active tip. Therefore there was little information relating to the chain of liability. As the Council owned most of the land in the area of potential contamination, it became the Class B person for that land. There were individual homeowners who had bought houses from the Council under the 'Right to Buy' scheme. Having regard to the hardship provisions in the statutory Guidance the Council felt that it would be unreasonable to make these owners liable for any investigation or remediation works. (Conversation with Principal Officer, SCC, October 2000).

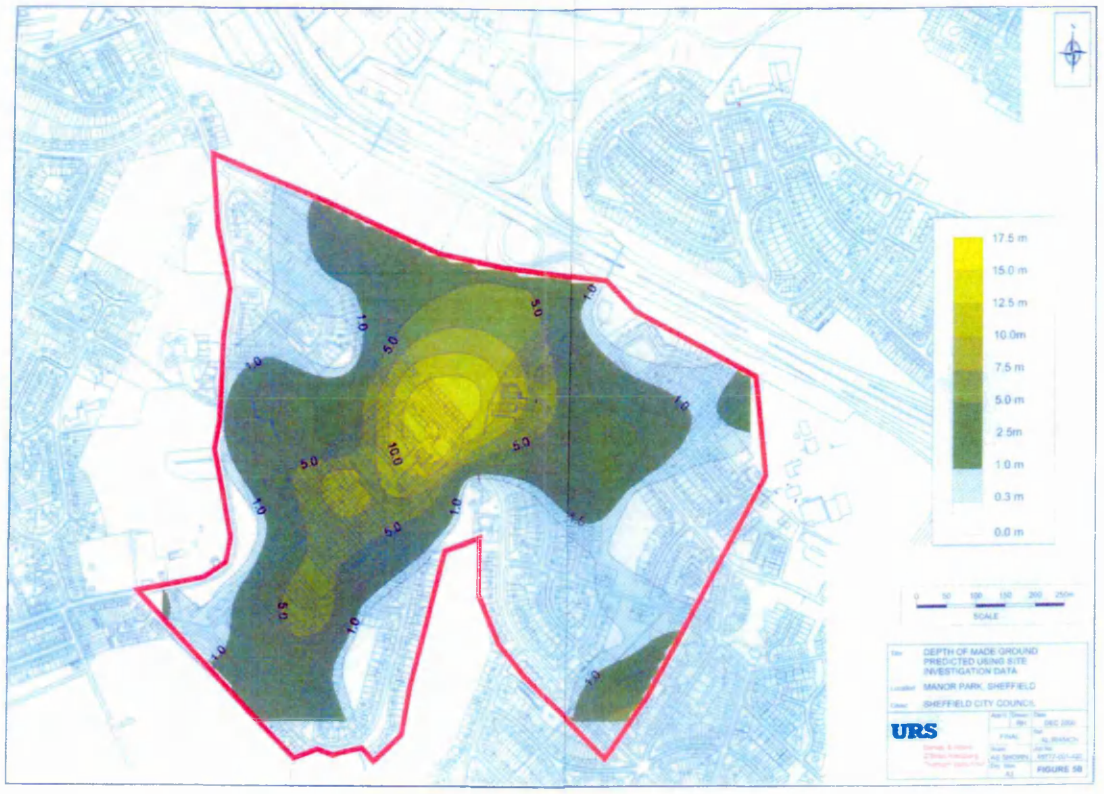
Supplementary Credit Approval (SCA) is available to local authorities to undertake investigations without the requirement to determine the land as *contaminated land* (see Chapter 2).

> *"Without the possibility of obtaining SCA it is unlikely that the Council would have been able to have undertaken such a thorough investigation and may have led to different conclusions eventually being reached" (Principal Officer, Sheffield City Council).*

The local authority successfully applied for £150,000 through the SCA scheme and prepared a tender in order to appoint suitable consultants. The successful contractors were URS Dames and Moore who satisfied the local authority that they could fulfil the requirements of the tender specification and undertake a scientifically robust, site-specific risk assessment, using a similar methodology to that likely to be used as part of the CLEA methodology.

> *"...care has been taken to ensure that the approach used is consistent with both current and draft UK guidance, and it is likely that the technical detail of the model developed for this study is somewhat above that of the 'default' approach likely to emerge in the future. It is therefore considered that this study provides a robust assessment of contamination at Manor Park" (URS Dames and Moore, Dec 2000:34)*

Figure 25 Map Showing Area of Predicted Fill Previous Site Investigation data



Source: URS Dames and Moore Dec 2000:Fig5A

The first stage of the investigation was to identify the levels of fill across the area of investigation. Levels of predicted fill were initially mapped using the local authority's previous site investigation data (see Figure 25). Further analysis of historic mapping between 1884 and 1981 provided evidence that there had been extensive filling across the site, with the main areas of filling being located in the valley running north east towards Corker Bottoms, and also in the north east area around the school.

Due to the size of the area to be investigated it was not feasible to analyse a very large number of samples for a large amount of contaminants, the majority of which might only be present in a small number of samples. Instead, a small 'scoping' exercise was carried out to determine those contaminants most likely to be present within the fill material in sufficient concentrations to present a health risk. The scoping exercise was undertaken mainly using data from Sheffield City Councils' previous site investigations. As a result of the scoping exercise the consultants suggested that the analysis of soil samples should be divided into three analytical suites. These are shown in Table 11 below.

Table 11 Analytical Suites for Soil Samples

Large Suite	Reduced Suite	Specialist Analysis
Arsenic	Arsenic	Asbestos
Cadmium	Cadmium	Loss on ignition
Chromium	Chromium	Benzene
Lead	Lead	Toluene
Mercury	Mercury	Ethylbenzene
Nickel	Nickel	Xylene
PAH (Screen)	PAH (Screen)	MTBE
Cyanide		Total organic carbon
PH		PAH (Speciated)
Phenol		

(Source: URS Dames & Moore, 2000:22)

8.2.1 Main Investigation

The main investigation consisted of 16 trial pits, 17 window samples, 10 hollow stem augered monitoring wells and taking more than 1,000 hand-dug surface and subsurface samples from gardens, the school and open areas. Ground Gas was monitored in 6 wells and groundwater was monitored in 4 wells.

The consultants had considered using an unbiased sampling density grid, such as the herringbone sampling pattern (URS Dames and Moore, 2000:23). However, for risk communication reasons, the Council felt that samples should be obtained from as many individual properties as possible.

As with any site investigation, there can be some degree of uncertainty with the final conclusions. This uncertainty can relate to the quality of analytical techniques used by the laboratory. In such circumstances, the uncertainty can be reduced by using an accredited laboratory. Additionally, choice of sampling location is important in determining which concentrations are observed at the site. It is possible to sample twice in the space of a few metres and obtain very different results if the contamination is heterogeneous. The consultants stated that the collection of a very large number of samples (over 1,000) and the use of geostatistics minimised the impact of such variability (URS Dames and Moore, 2000:39).

8.2.2 Results of the Main Investigation

The made ground composition was highly variable, ranging from granular to clayey fill, with abundant ash, slag and coke, bricks, pipes, bottles, wood, leather *etc.* Made ground towards the south, in particular the south eastern corner of the site, tended to contain more building refuse *(e.g.* bricks, concrete, tarmac and plastic). Across the site, made ground was overlain by a variable thickness of topsoil.

Groundwater was encountered both in the made and natural ground. Flow direction was difficult to establish but was assumed likely to be dominated by topography and flow down gradient from south to north.

Methane was not detected in any significant quantities. Carbon dioxide was found to be elevated above the 5%v/v on only one occasion. As this elevated concentration was observed on common land at the north of the estate this result was not considered to be significant. Observed contaminant concentrations in residential properties, and shallow open spaces are summarised below.

8.2.3 Risk Assessment Methodology

The consultants developed risk-based screening levels for the two dominant land-uses at the site, residential land and recreational park-land (See Table 12 below). Unlike CLEA the RBSLs did not differentiate between high- and low-density housing (that is housing with gardens and housing without). Screening levels were not developed for commercial land-use, as the consultant assumed that human exposure to soil contamination will be very low in these areas. This is again different to the method now adopted by CLEA where the Soil Guideline Value may still be fairly low to be protective of the pregnant female worker (DEFRA, 2002a).

Table 12 Land-use and Exposure Pathways

Exposure Pathway	Land-Use Type	
	Residential Housing	Recreational Parkland
Soil Ingestion	✓	✓
Dermal Contact	✓	✓
Indoor Dust Inhalation	✓	✓
Outdoor Dust Inhalation	✓	✓
Indoor Vapour Inhalation	✓	✓
Outdoor Vapour Inhalation	✓	✓
Vegetable Ingestion	✓	×

✓Pathway Modelled × Pathway not Modelled

Source URS Dames and Moore, 2000: Appendix C:3

The modelling technique used to develop the RBSLs was probabilistic and was based on the principles adopted by the draft CLEA model.

> *"The screening levels were calculated to be protective of both the Manor Park population as a whole, and individuals who are more highly exposed as a result of their physiology or behaviour" (Dames and Moore Dec 2000:35).*

The risk based screening levels were derived taking into account the following:

- *Exposure point concentrations*
- *Human dose estimation*
- *Effects assessment*

  - *Exposure point concentrations being chemical concentrations in environmental media at the points at which exposure is assumed to occur. Simple algorithms and assumed site physical characteristics were used to calculate these concentrations.*
  - *The human dose estimation step involved the use of assumptions regarding human physiology and behaviour to calculate the chemical dose that each of the identified receptors could be exposed to as a result of performing their assumed activities.*
  - *The effects assessment consisted of a review of available (published) toxicity data, in the form of Tolerable Daily Intake (TDI) or Slope Factor (SF) values, and the identification of suitable effects criteria for the chemicals of potential concern.*

Source: URS Dames and Moore 2000:20

For all contaminants identified, Risk-Based Screening Levels were calculated. These are theoretical soil or water concentrations below which pollutant linkages cease to be significant. Maximum acceptable risk levels of one (non carcinogens) and 10^{-4} (carcinogens) were used in this study. The RBSLs for residential areas are summarised in Table 13.

At concentrations below the RBSL, the potential risk to the health of residents of the estate was considered by the consultant to be negligible. At concentrations above the RBSL, the risk to the health of estate residents was considered to be potentially significant.

Table 13 The Risk Based Screening Levels Adopted for Residential Properties

Summary of Residential Risk-Based Screening Levels for the Manor Park Estate	
Chemical	**RBSL (mg/kg)**
Arsenic	790
Cadmium	80
Chromium (III)	815290
Mercury	583
Lead	1985
Nickel	2872
Cyanide (Free)	645
Acenaphthene	4703
Acenaphthylene	2276
Anthracene	23250
Benzo(a)anthracene	277
Benzo(a)pyrene	28
Benzo(b)fluoranthene	277
Benzo(g,h,i)perylene	2463

Source: URS Dames and Moore 2000:21

There is a significant difference between the available Soil Guideline Values (See Chapter 3) and the above RBSLs for residential properties with gardens. The differences may largely be attributed to the fact that the RBSLs were derived to be protective of the Manor population as a whole rather than the critical receptor (female child in the 0 – 6 range) as adopted by CLEA. In addition, the consultants used a tolerable daily intake method for the calculation of an RBSL for Lead, which again is not consistent with CLEA.

The Consultants assumed it to be highly likely that individuals would be exposed to localised areas of contamination mainly within their own property. This assumption was based on the behavioural aspect of the risk assessment. It was considered most likely that individual exposure to contaminant concentrations would be greatest in individual gardens. In addition the assessment was made across the site as a whole. This is a similar approach to that adopted in the CLEA framework, which adopts the approach of concentrating the site investigation in the "*averaging area (or area of interest)*" (DEFRA 2002c:13).

Where contaminant concentrations at a particular averaging area exceeded the appropriate RBSL, a potential risk was assumed to exist (URS Dames and Moore 2000). In these areas additional sampling was carried out to gain a more accurate statistical representation of contaminant concentrations.

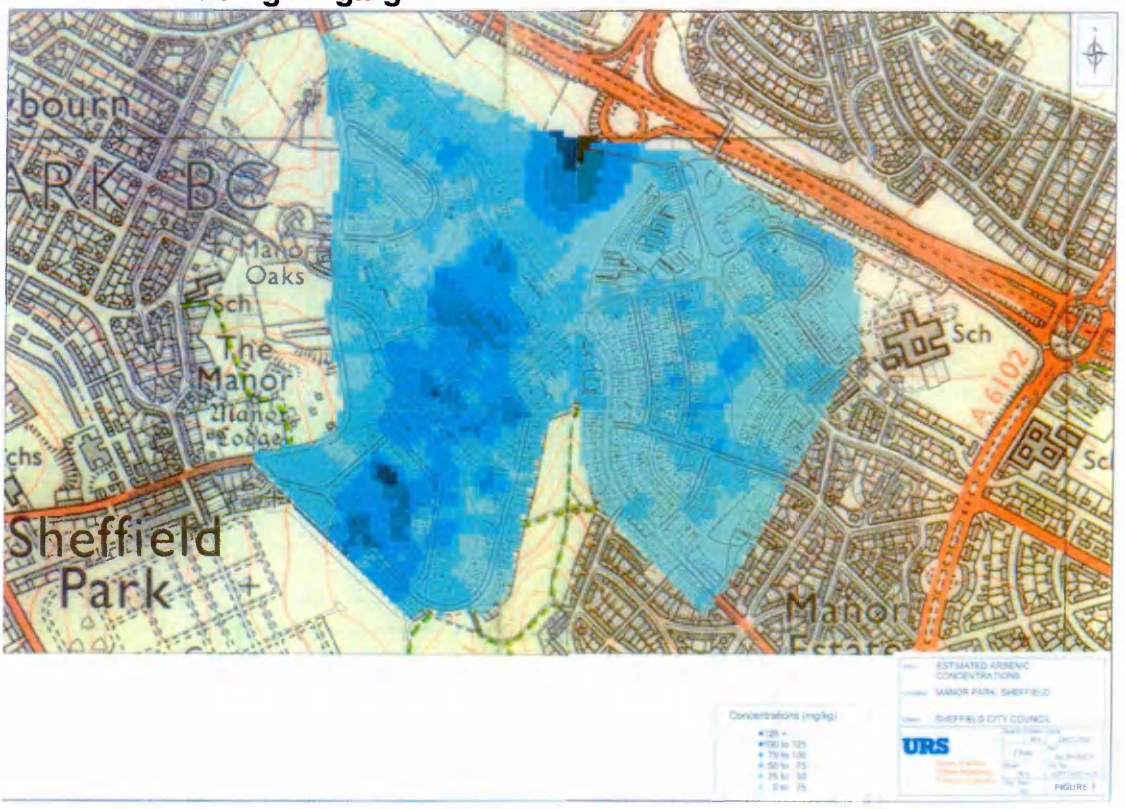
Analysis of the contaminant concentrations showed three contaminants (lead, arsenic and PAH) in areas of the site at levels in excess of the RBSL. Additional samples were collected from each of the areas where the RBSL had been exceeded.

Collected PAH samples were speciated into individual PAH compounds to provide a more accurate assessment of the toxicological characteristics of the contamination than would be attained through the simple measurement of total PAH concentration (URS Dames and Moore, Dec 2000).

Additional sampling, in those properties initially observed to have contaminant concentrations in excess of the risk based screening levels, identified average concentrations that were below screening levels. It was considered by the consultants that this additional sampling was sufficient to show health risks at these properties were insignificant.

> *"The RBSLs were derived in order to protect 99% of the population to a non-cancer hazard index of 1 and an increased lifetime cancer risk of 10^{-4}. Some uncertainty does exist due to the shape of the population distributions used (they tend to infinity, rather than having absolute upper and lower limits)" (Dames and Moore, Dec 2000 pg:40)*

Figure 26 Results of the Predicted levels of Arsenic Across the site using Kriging



Source:URS Dames and Moore Dec 2000:Figure 7

The production of plots of contaminant distribution across the Estate involved the use of geostatistical methods (specifically, kriging) in order to interpolate concentrations at points that have not been directly sampled.

> *"The use of such kriging analysis to interpolate site data involves several mathematical assumptions, which can affect the accuracy of predicted contaminant distributions. A key uncertainty relates to the fitting of a mathematical model to describe the semi-variogram produced for each contaminant". (URS Dames and Moore, 2000)*

An example plot is show in figure 26. The use of kriging can be useful to target areas for further inspection, but may potentially miss hot spots of contamination. It is suggested that kriging can only provide an indication of the overall ground conditions and should only be used with caution where there has been a statistically significant number of soil samples.

8.2.4 Risk Communication Strategy

The Council was criticised at the time of the investigation because it had taken approximately 6 months from initial identification of the problem to actually

undertaking the investigation. Part of the delay was due to the time to prepare and obtain approval for Supplementary Credit approval money, get the necessary approval from the local authority committee and then going through the normal tendering process.

Residents argued that they had been kept in the dark and were potentially being exposed to harmful chemicals. Residents' concerns were highlighted in the local press. One resident stated that she had stopped her children playing in the garden

> *"I just don't think its safe...I just wish I'd known about it earlier because you just don't know how safe it is" (Sheffield Star 28th Sept 1999).*

Another resident said:

> *"We always thought there was something funny about it... people's health round here has not been good, with a lot of cancer and we're wondering if this is responsible. But it's awful that it's taken so long for them to tell us about it." (Sheffield Star 28th September 1999)*

All residents affected were contacted individually and provided with an information note. The information note provided a brief summary of the reason for undertaking the investigation and precautions that residents should take (e.g. washing hands and vegetables before eating). In addition the local health authority were consulted, along with press releases and public meetings.

Analysis of health authority data suggested that there were increased incidences of some health effects such as cancer, bronchitis, premature birth etc. However, in the area concerned there was another set of social and economic factors that were more probable factors in causing these ailments. These included factors such as smoking, and poor diet.

Despite the fact that many residents had bought their houses under the right to buy scheme, the concerns on this estate related primarily to the residents' health risks rather than a potential blighting of houses.

8.2.5 Risk Assessment Conclusion

The consultants concluded that although the Manor Park Estate is underlain by waste and fill materials contaminated with PAHs and heavy metals, the

concentrations of these chemicals at the ground surface is insignificant in health terms at all sampled properties. On this basis, it was considered that no immediate health risks existed at the estate from land contamination, and that residents of the estate should continue to use their homes and gardens as normal, including growing vegetables.
Therefore in relation to the statutory guidance a pollutant linkage was established by the consultant, but this linkage was not deemed to be *significant*. Therefore the properties in this area were not determined as *contaminated land*.

8.2.6 Summary

This area of land was identified as a result of an unrelated Council site investigation and would not have been identified as a result of the Inspection Strategy. The site may also not have been investigated as part of the planning and development control process as the site had no apparent history of a previous land use likely to cause contamination.

Due to the timing of the site investigation, no soil guideline values were available to assess the potential risk to residents on the estate. The consultants used a method similar that of the CLEA model but were not as conservative in its assumptions. This has therefore led to a potential underestimate of the risk at some individual properties when compared against the current SGVs. For example the RBSL derived by the consultant on the estate were 790mg/kg for arsenic and 1985mg/kg for lead. The SGV for arsenic and lead in residential gardens are 20mg/kg and 450mg/kg respectively. It is the author's opinion that a further assessment of some of the properties may be required in the future. Other local authorities may be unwilling to investigate sites where an SGV is required but has not yet been developed for fear of having to re-investigate land that they previously stated was 'safe'.

The procedure for obtaining funding to undertaking such site investigations appeared to take an excessive time before works commenced with the investigation. This is due to the fact that the Council would not instigate the investigation until it had written confirmation that the application for SCA was successful. There may be other methods of speeding up the process such as

allowing local authorities to decide whether SCA (or similar scheme) is applicable to a particular site, rather than DEFRA. The local authority would then be accountable at a local level for its decisions.

8.3 CASE STUDY 2: THE IDENTIFICATION AND REMEDIATION PROCESS – TOTLEY, SHEFFIELD

This case study involves 27 private houses in Totley, Sheffield that were developed circa 1940. The dwellings are predominantly 2-storey semi-detached, with six older properties, one of which was part of a former lead rolling mill. There is a mixture of ownerships at the site including freehold/ leasehold, owner-occupier/rented. The majority of residents have lived there in excess of 10 years with no apparent health effects.

Totley is located in the South west of Sheffield close to the border with North-East Derbyshire. It is an area not associated with heavy industry. The study area surrounds the junction of two watercourses, the Old Hay Brook and Totley Brook, which join to form the River Sheaf. The area immediately surrounding the watercourse is wooded.

This site came to the attention of the Council in March 2000, prior to the implementation of Part IIA of the Environmental Protection Act 1990 and therefore prior to the development of an inspection strategy. The Council's Environmental Protection Service became aware of elevated levels of lead following a site investigation undertaken on behalf of a third party who was undertaking drainage works in the area. Soil samples had been taken as a matter of routine, which revealed elevated levels of lead in the soil. One sample recorded levels of lead of 45,000mg/kg (the ICRCL trigger level for public open space being 2000mg/kg). These levels of contamination were recorded in the top 50cm of soil. Due to the close proximity of residential houses the Council was concerned about the potential for significant harm. The Environmental Protection Service undertook a basic phase 1 desk study looking a historical maps and archive records relating to the site. The findings of the desk study revealed that in the area there had been a lead smelter a lead rolling mill and an associated mill pond.

Figure 27 1894 OS County Series Map Showing Totley Case Study Area

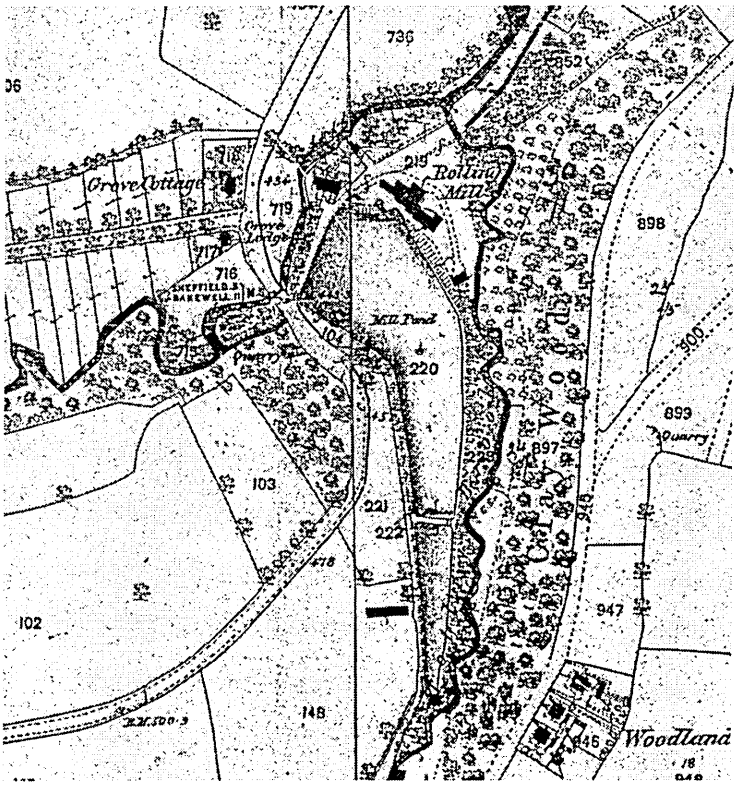


Figure 28 1903 OS County Series Map Showing Totley Case Study Area

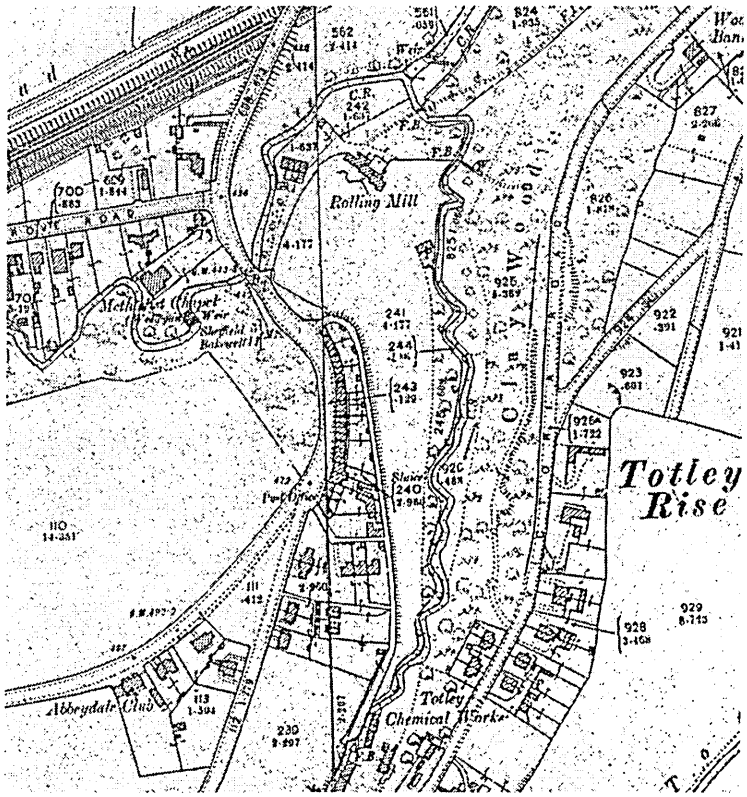


Figure 29 1930 OS County Series Map Showing Totley Case Study Area

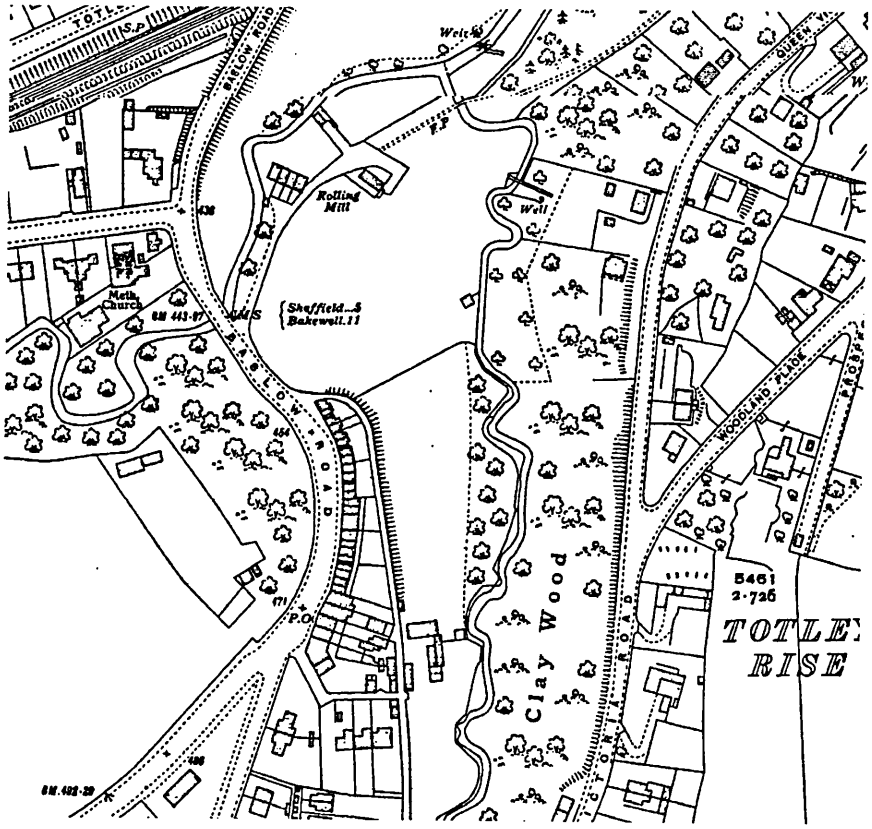


Figure 30 1964 OS National Grid Map Showing Totley Case Study Area

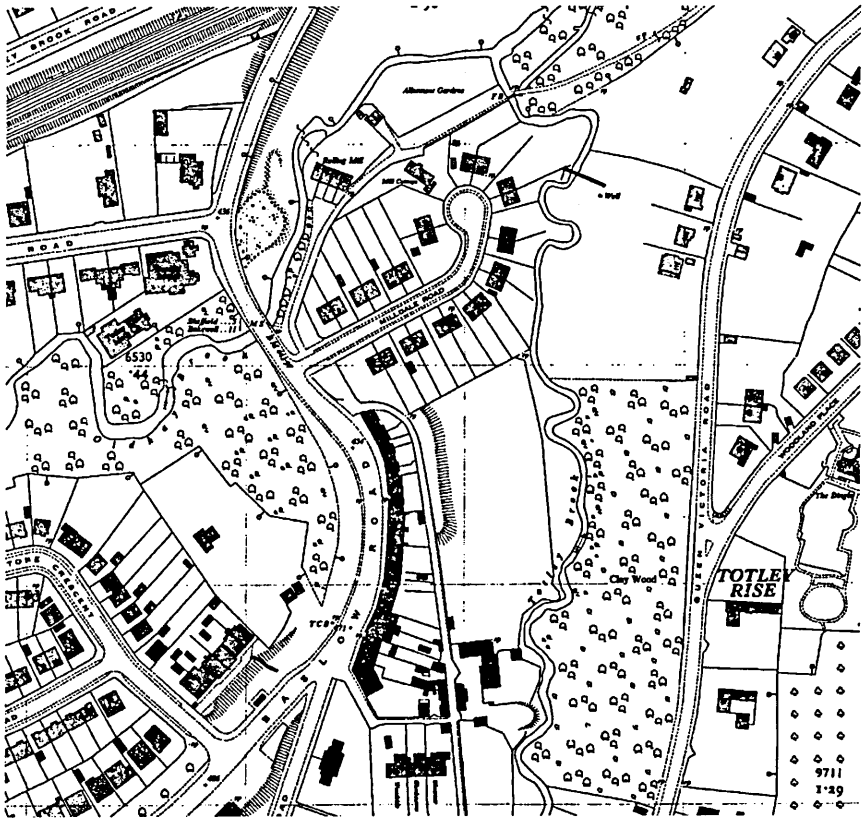


Figure 31 Totley Case Study Area - Present

Source: Sheffield City Council Aerial Photograph, 2002

The lead smelting and rolling facility was operational from the early 17th Century until the late 19th Century, during which time the processes carried out included lead smelting, rolling of lead and smelting of lead slags. A Cupola was known to exist on site circa 1780. There was a large millpond on site, which was in-filled in the first half of the 20th Century.

Part of the site was developed for housing between 1938 and 1940 prior to any development controls relating to contamination (the area edged 'white' in Figure 31). All of the properties on the estate had reasonably well maintained gardens with lawned areas and well established shrubs and trees. A number of the residents grew their own vegetables and had done so for over 10 years. The Totley Brook and the Old Hay Brook formed the boundary of many of the garden areas (see Figure 31 above).

The remainder of the millpond area was developed in 2001/2 for residential housing (the area edged in 'blue' in Figure 31). No conditions had been attached to planning consent on this development, as this area had previously not been considered by the Council to have had an industrial legacy. The development went ahead after the Council argued that Part IIA would be used on the new development, should an appropriate risk assessment and remedial strategy not be submitted. The developer agreed to this request and an investigation was undertaken. The investigation by the developer did not identify levels of lead at the same concentrations, the average being 2,000mg/kg. However, a suitable capping layer of clean-soil was placed in garden areas of this development. As this development was in a flood plain, a large amount of material had to be imported onto site anyway to raise the site levels.

Having identified a potential source of contamination the Council had one topsoil sample analysed from the surface of each garden area of the properties on Mill Lane and Milldale Road. The samples were analysed for metal contamination (As, Cd, Cr, Zn, Pb, Cu, Ni and pH). The results identified that 28 out of 30 properties tested had levels of lead above the 500mg/kg Trigger level adopted by the ICRCL 59/83 (1987) guidance (now withdrawn (DEFRA, 2002f)). The mean average level of lead in soil was identified to be 7500mg/kg of lead with two samples recording levels in excess of 20,000mg/kg.

> *"The harmful effects of lead can include a variety of symptoms, such as anaemia, fatigue, tremors, abdominal pains and, in extreme cases, death (SWK, 2001:11). Research has indicated that the neurological development of young children can be affected by lead, resulting in intellectual impairment and behavioural difficulties. The severity of impacts can be correlated with the blood lead concentration of a child" (SWK, 2001:12)*

The SNIFFER publication *Communicating Understanding of Contaminated Land Risks* (1997) highlighted research by Baird, (1986) which identified that "*denial of risks is most frequently expressed by those at greatest risk from the hazard*". The same publication suggested that the "*denial of risk implies that individuals are unlikely to be concerned or have the time to consider contaminated land issues*" (SNIFFER, 1997:14)

The Council arranged face-to-face visits to discuss the findings with each resident. This communication strategy was effective in providing information about potential risk to residents but has had a significant impact on resources.

Concerns raised by residents related to the health aspects and the potential impact on property prices. One of the Environmental Health Officers recalls a number of the residents becoming quite aggressive when they were told about the situation.

8.3.1 Liability

Due to the historic nature of the lead smelting activity the Council were not able to identify any Class A responsible person. In accordance with Part IIA and the statutory guidance, the owner of the land then becomes the responsible person. A number of the residents also raised the possibility of taking legal action against the Council if it made the homeowners responsible for the costs of remediation.

The statutory guidance (DETR, 2000a:paraE44:134) states that:

> *"Where a class B person owns and occupies a dwelling on contaminated land in question, the enforcing authority should consider waiving or reducing its cost recovery where that person satisfies the authority that, at the time the person purchased the dwelling, he did not know, and could not reasonably have expected to know, that the land was adversely affected by the presence of a pollutant"*

Paragraph E.45 goes on to state:

> *"Any such waiver or reduction should be to the extent needed to ensure that the Class B person in question bears no more of the cost of remediation than it appears reasonable to impose, having regard to his income, capital and out goings" (DETR, 2000a:para E.45:134)*

The Council felt that it would be unreasonable to make the 'innocent' home-owners responsible for the investigation and potential remediation of their gardens. A political decision was made that where SCA money was available, it would be used to remediate sites where the homeowner became the liable person. The Council did not take into account the advice in the statutory guidance, paragraph E.45 when deciding not to make any of the residents pay for remediation.

8.3.2 Assessing the Potential for Harm

Blood lead tests were offered to those residents that wanted them and a questionnaire was provided to identify behavioural characteristics at the site. Of those residents who accepted the offer of a blood lead test all received 'normal' results. The questionnaire survey revealed that there were a number of residents on the estate that had lived in their property since it was built and had grown a variety of vegetables in their garden during this period. There were also a small number of residents with young children under the age of six.

Other site-specific data collated by the Council included testing vegetables for lead uptake and bioaccessibility. The vegetable samples (with the exception of a beetroot) were all found to be within the normal range when compared to acceptable levels of lead in commercially grown crops. It was concluded that the higher than expected level of lead in the beetroot sample related to the way in which the sample was prepared rather than the ability of the beetroot to absorb the lead.

Two samples were sent to the British Geological Survey to undertake PBET (physiologically based extraction test) analysis to determine how much of the lead in the soil could be bioaccessible. The results of two samples suggested that the lead was nearly 90% accessible. The bioavailability of lead has since been 'factored' into the Soil Guideline Value for lead and would no longer be required as part of the risk assessment.

8.3.3 The Determination Notice and Funding

Having identified a significant pollutant linkage and the significant potential for significant harm, the Council determined each property as contaminated land in accordance with S.78A (2) of the Environmental Protection Act 1990. The local land charges department was notified that responses to the new local land search Question 16.1 on the Con 29 should be 'yes'. This would then highlight the fact that the site had been designated as contaminated land to potential purchasers.

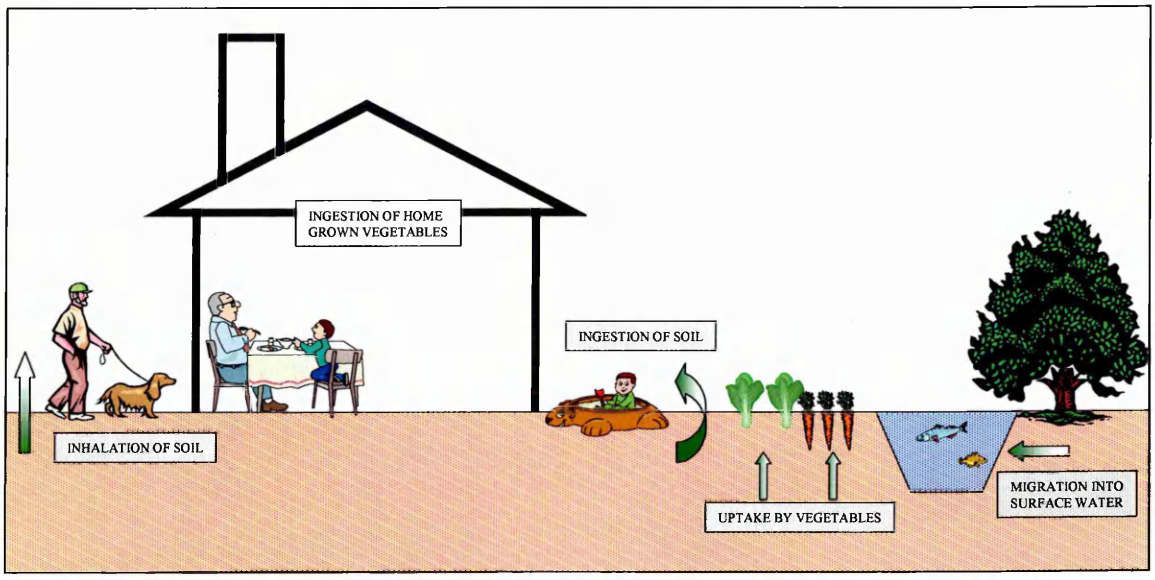
The Council then applied for Supplementary Credit Approval to fund a site-specific investigation of the mill pond area (excluding the development site) and the surrounding area.

The Council may have suggested that, based on the site specific data, no actual harm appeared to have been caused to residents living in the affected properties, and that the potential for harm could be 'managed' without physical removal of soil. As one resident stated:

> *"people have lived in nearby villages in North East Derbyshire for Centuries and never come to any harm…because they know it's there…"*

However, there remained the *significant possibility of significant harm.* For example if a small child had consumed a sufficient amount of soil at the identified concentrations, there is the definite possibility that there would be an observable health effect over time. Figure 32 below shows the conceptual model for the site at Totley.

Figure 32 Totley Conceptual Model



The Council were successful in their application for SCA funding and, following a report to the local authority Cabinet Members, permission was granted to go through a formal tendering process. Following the formal tendering process the Council commissioned consultants Scott Wilson Kirkpatrick to undertake appropriate *remediation assessment action* in accordance with B20 of the Statutory Guidance. The purpose of the assessment action was to identify the

extent of contamination, and where necessary, propose suitable remedial treatment action. From the identification of the problem to the appointment of consultants the process had taken one year.

8.3.4 The Main Site Investigation

The aim of the site investigation was to provide information on the following areas:

- Lead concentration in soils in gardens and areas of open space
- Concentrations of a range of contaminants around the site of the former Totley Chemical Works
- Concentrations of lead in groundwater

Site investigation works consisted of:

- hand-dug shallow pits to collect soil samples for chemical analysis. This involved collecting 2 samples from each garden at depths of 0.2m and 0.5m.
- window sample holes to prove geological succession of strata and collect soil samples for chemical analysis;
- cable percussion boreholes to prove geological succession of strata and collect soil samples for chemical analysis;
- collection of sediment samples from Totley Brook for leachate testing;

Boreholes showed ground conditions that consisted of topsoil and subsoil overlying sandy clay, with bedrock of Coal Measures mudstone encountered at approximately 3m depth below surface. Fill material was identified in some locations, and included the presence of fragments of pottery and brick material overlying bedrock. (SWK, 2001:10)

The majority of soil samples were analysed for total lead concentration only. A smaller number of soil samples were analysed for a standard ICRCL suite of contaminants (As, Cd, Cr, Zn, Pb, Cu, Ni and pH). This additional analysis was concentrated in the samples from around the former Totley Chemical Works. Sediment samples were analysed for leachable concentrations of the ICRCL suite of contaminants.

As with the Manor Case Study, samples were take from each garden area for risk communication purposes. The additional number of samples also enables greater statistical confidence to be reached in the final analysis

Closer analysis of the results indicated that the highest concentrations of soil lead were situated in the gardens of properties on Milldale Road and Mill Lane, where levels of up to 23,000mg/kg were recorded. The average level of lead in Mill Lane and Milldale Road was 7,500mg/kg. In the remainder of the Study Area, lead concentrations were generally lower, although frequently greater than 500mg/kg. The mean lead concentration for the entire study area was 2,507mg/kg. Without proper analysis it could be argued that all the gardens, which were investigated, should be remediated. Therefore, the 'averaging area' needs to be chosen carefully.

Five samples were submitted for analysis for lead bioavailability by the consultants, using a multi-stage Physiologically Based Extraction Test (PBET) method at Robertson Laboratory. The samples submitted were selected from those samples that were outside the Milldale Road/Mill Lane area but that had lead concentrations in excess of 1,000 mg/kg. The results indicated generally low bioavailability for these samples, typically less than 10% and a maximum value of 29%. These results contrasted with the two bioavailability tests undertaken by British Geological Survey Laboratories on behalf of Sheffield City Council on samples taken from Milldale Close, which indicated high bioavailability. One explanation provided by the consultant for this difference was that the samples taken outside the Mill Lane/Milldale Road area (with low bioavailability) may represent background lead concentration from diffuse sources. A more probable argument is that it is due to the different techniques used in the laboratories and the general variability in results obtained using this method (Telephone conversation with Joanna Wragg, BGS Laboratories and Paul Board at Robertsons Laboratories, 20th February, 2002).

8.3.5 The Risk Assessment

The results of the site investigation identified that the levels of lead were elevated in the area surrounding the former lead smelter and highest on the site of the former lead smelter.

The consultants in their advice about the toxicological effects of lead noted that harmful effects may be manifested in children where blood levels exceed 10/lg/dL. This advice was based on information from the World Health Organisation. The consultant also stated that the critical receptor was the small child aged 0 – 2 (SWK, 2001:10)

When assessing overall exposure to lead in the soil, consideration should to be given to atmospheric lead, lead in drinking water, lead in vegetables, lead from other potential dust sources such as paint (SWK, 2001:10). The Consultants noted that:

> *"In order to precisely quantify any individual's lead intake, all of the above must be taken into account in addition to the intake of lead from contaminated soil. In most cases, such detailed information is not available and default values are assumed for some or all of these sources. Default values can be based on public health studies or calculated values, and are generally realistic yet conservative estimates of likely lead exposure". (SWK, 2001:13)*

However, in this particular case there was a significant amount of information available to the Council and to the Consultant. In determining the potential for risk to human health on a site-specific basis at this site, much of this information was not taken into account.

In the absence of the CLEA model, the risk from lead was assessed using the *Framework for Deriving Numeric Targets to Minimise the Adverse Human Health Effects of Long-term Exposure to Contaminants in Soil (Report SR 99(02)F)*, produced by the Scotland and Northern Ireland Forum for Environmental Research (SNIFFER). This model is based on similar assumptions to the CLEA model, and was considered to be the most appropriate model to use as it was specifically produced for the UK situation. The model is deterministic rather than probabilistic (i.e. it carries out a single set of exposure calculations rather than using a Monte Carlo type approach of calculating multiple exposures to generate a probability density function). Using

the calculations and default assumptions contained in The 'SNIFFER model', the remedial target concentration was identified as 591mg/kg.

> *"The equations for calculating remedial targets for lead in soil follow a different methodology than for other contaminants. Whereas for other metals and organics, it is customary to define a maximum tolerable daily intake (or similar value), the detailed knowledge available on the toxic effects of lead means that it is more appropriate to set a target blood lead concentration, and then use a biokinetic factor which relates blood lead concentration to soil lead concentration to derive an appropriate remedial target for lead" (SWK, 2001:15)*

A review of the data raised the potential that nearly all the properties that had been sampled may require remediation if the SNIFFER value for lead in soil was used as a criterion for soil removal. The consultants therefore suggested a tiered approach in order to enable:

> *"the cost effective remediation of the worst affected areas, whilst not ignoring the potential concerns (albeit of lower magnitude) that may exist in the surrounding area" (SWK, 2001:15)*

The Council felt that this provided the most suitable option. The next phase involved the identification of a level of lead, above which the Council was not satisfied that the risk could be managed.

The consultants identified the Integrated Environmental Uptake and Biokinetic (IEUBK) model developed in the United States as a potentially suitable model with which to identify a 'clean-up value'. This model predicts childhood blood lead levels using information on soil lead, lead concentrations in other media such as food, water and air, and the partitioning behaviour of lead in the human body.

Using default assumptions for non-soil lead exposure, the consultants identified two levels of lead in soil that have been set in the US. This was 400 mg/kg for children's play areas and 1,200mg/kg as a yard wide average for bare soil (the term "yard-wide average for bare soil" refers to the average lead concentration in the areas of bare soil within a single garden).

> *"These levels have been set on the basis of a US-wide cost-benefit analysis, and are intended for use in prioritising national remedial action. These figures are likely to be somewhat conservative in the context of UK gardens, since the area of bare soil in a typical UK garden is likely to be less due to the difference in climate". (SWK, 2001:12)*

The consultants recommended that, where levels exceeded 1200mg/kg, that contaminated soil should be removed to a depth of 750mm and replaced with a physical barrier (e.g. a geogrid) and clean soil cover. The choice of 1,200mg/kg as an action level was slightly arbitrary due to the fact that it had been developed to suit different soil conditions. Indeed the soil guideline value for lead (DEFRA, 2002c:7) specifically advises against using the IEBUK model. The SGV for lead in residential gardens has been set at 450mg/kg. However, using the SGV value as a clean-up criterion may have meant the remediation of a substantial part of the Totley and Dore areas of Sheffield.

> *"There is clearly a need to prioritise resources in dealing with public health and environmental problems, and it may be the case that setting a low target , concentration may lead to expenditure on remedial action disproportionate to the public health benefits. It is for this reason that a higher threshold value of 1,200 mg/kg is recommended as the limit above which physical remediation of the gardens is required" (SWK, 2001:17)*

In areas outside the area of the former lead works, where levels of lead in soil were below the 1200mg/kg and exceeded 591mg/kg, (the value derived from SNIFFER) an advisory note should be sent to residents advising them to use proper hygiene procedures and to prevent young children playing with the soil.

8.3.6 Remedial Actions

The recommendations of the Consultants required 27 of the properties that had been investigated to have their gardens remediated. The Council having regard to the hardship provisions inserted into the statutory Guidance applied to DEFRA for Supplementary Credit Approval for the remediation and re-instatement of garden areas. The choice to re-instate gardens was "a matter for the local authority" (email communication with DEFRA 15th November 2000). Again a political decision was taken that this was acceptable. The original estimated costs to undertake this work was £650,000.

Having identified the need to undertake remedial work in these gardens, it was then necessary to start the preparation for creating a tender document. During the preparatory works a number of complicating factors were identified. These may be summarised as follows:

- Limited access into a number of rear gardens due to residents having built side extension.
- Limited vehicular access into Mill Lane and Milldale Road
- Access to the Mill Lane and Milldale Road is difficult for heavy vehicles due to a 'blind bend' on the main road where motorists tend to travel in excess of the legal speed limit.
- There was no suitable provision for a site compound and secure area.
- The gardens have a significant number of well-established trees that would have to be felled if remediation was to be undertaken in accordance with the consultant's recommendations.
- Removal of these trees could create the possibility of ground swelling (heave).
- The 'Totley Brook' forms the boundary of 10 properties and there is the possibility that undertaking the remediation of the gardens could damage the 'long-term' stability of the bank.
- There are live services (gas, water, electricity, telephone lines) that need to be maintained
- The site will remain occupied by the residents throughout the period of the works.
- The recommended time for earthworks is during the spring/summer months, and autumn/winter months for replanting of trees shrubs.
- Potential long-term liabilities of the Council relating to latent property defects or damage to the riverbank.

(Based on the authors personal experience)

In addition to the practical obstacles that had to be overcome, many of the residents were of the opinion that the remedial works were "unnecessary" and a "waste of money". It is likely that, had the Council been unable to obtain SCA monies to undertake this work, that a legal challenge would have been made by the residents against the Council's decision to determine the land as contaminated land. It is the author's opinion that many of the residents only allowed the Council to undertake the remediation works on a voluntary basis due to the potential impact on property values.

The fact that the Council had decided to re-instate gardens meant that the tendering process was prolonged while garden areas were surveyed and tender documents created to identify plant species and show their approximate location.

The Council examined various alternative remediation strategies at the site including retaining some of the well established trees and shrubs and removing soil by hand digging under the canopies. Advice from a tree specialist

suggested that this was a not feasible option due to the likely damage that would be caused in the long-term. Whilst it would have been acceptable from a public relations aspect to retain the trees, the Council would not be able to achieve a >95% remediation of the gardens and minimise the potential risk to human health. It would therefore be necessary to remove all trees.

The removal of trees and the potential for heave meant that a further investigation relating to the expansiveness of the soil on a garden by garden basis was required. The conclusions of this investigation identified only a small number of trees that should be retained due to their proximity to the property (SWK, 2003).

The length of time it takes to complete the tendering process from the initial SCA application to entering into a binding contract with a suitable contractor was a significant stumbling block given that the preferred seasons for undertaking the remediation work are summer and autumn. The delays were caused by the time to assess the initial application, internal reporting procedures and approval to spend the money at the Council, and the time for contractors to assess the scope of the works in order that they can price them. These delays, coupled with a need to further investigate the potential for heave, meant that the works were delayed by a year. The findings of the additional investigation found that, with the exception of a small number of trees, the potential for heave was identified as being 'low'.

The Council originally intended to undertake the remediation of all 27 gardens at the same time. However, this would have meant preventing pedestrian access and causing difficulties with residents in terms of accessing their properties. Alternative car parking would have to have been identified along with associated security risks. It was therefore decided to undertake the work in two stages with 15 of the properties forming the first phase and the remainder would be undertaken following completion of the first.

A competitive tendering exercise was completed in June 2003 and the successful contractors, English Landscapes, started work on site in July 2003 with completion due at the end of December (that is three years since the

problem was first identified). The remaining properties will be remediated between July and December 2004.

A site compound had to be formed on two adjoining gardens that were located approximately 100m from one of the former cottages. The site could accommodate sufficient space for site cabins, washing facilities and to store the residents' garden furniture. This obviously created difficulties with the houses concerned due to the residents still living in their properties.

Due to the limited access in the area, small excavators and dumpers were required to remove the majority of the soil. In order to maintain services, front gardens were hand-dug. Most of the properties only had a small area in the front garden that would have to be removed. A reduced dig (300m) had to be undertaken close to structures in order to prevent damage to them. In areas close to the riverbank and in areas close to property, the remediation strategy has been to involve a reduced dig and has meant that some trees have had to remain in place.

Works on this first phase have almost been completed and, whilst most of the residents are satisfied that their gardens have been remediated properly, there have been a number of issues, which have occurred during the works. These are summarised as:

- Boundary disputes – even though the Council and the Contractor measured these accurately prior to the works, there were some delays whilst residents complained about the fact that the boundary didn't necessarily match with the one in their deeds. The Council had always stated that it was replacing like with like and that any boundary disputes could not affect the works. Such matters would have to be taken up privately.

- There were some complaints of damage to property e.g. drives and superficial cracking of some rendering in two properties used as access for most of the garden areas.

- The fact that the site was occupied meant that residents wanted to be involved in the process, which tended to cause problems with progress.

- There was also the concern raised by some occupants about the fact that they were being exposed to more of the potentially harmful dust than they would have ever been exposed to under normal conditions.

- The stressful nature of the remediation works was noted by some residents as being more detrimental to health than the lead contamination

8.3.7 Property Values

Some houses have been sold on the site on the basis that the Council had identified the need to undertake the remediation and that funding had already been secured from DEFRA to undertake the works. Paragraph E.44 of the Statutory Guidance suggests that if, when a person purchases a property, they know it is contaminated then they should be held responsible for the cost. (DETR Circular 02/2000). However, the Council felt that it would be unfair to penalise the original owners who had intended to move before the elevated levels of lead were identified. Had the Council not taken this decision, it is likely that the properties would not have sold because the average cost of remediating each garden is in excess of £20,000.

One of the former Rolling Mill Cottages actually appeared on the Channel Four programme *Location Location Location* with no mention of the fact that the property had been identified by the Council as contaminated land. The property was eventually sold at just under the asking price. Two other properties on Milldale Road also sold at close to the original asking price. It should be noted that the contaminated land factor was not built into the recommended asking price (telephone conversation with Blundells Estate Agents 7th July 2003). However, one property, which was not part of the first phase of remediation works, was placed on the market at a time when the remediation was being undertaken. This property was originally placed on the market at £145,000 and a significant number of viewings were made by prospective purchasers. Enquires were made to the local authority which stated the Council's position regarding remediation. This property eventually sold for at least £20,000 less than the original asking price. Whilst the property was in need of some modernisation, this fact was taken into account at the original valuation. The loss in value (14%) may largely be attributed to the visual aspect of the remediation works. This concurs with the findings of research Kinnard *et al,* in the US who suggested that:

"For soil contamination from toxic (including radioactive) materials, intense publicity about the contamination, especially when coupled by delays in effective remediation can produce negative price impacts as high as 5-10% up to a distance of one half mile." (Kinnard et al, 1995:15)

8.3.8 Cost

The cost for undertaking the remediation and re-instatement of 15 gardens has cost approximately £600,000. A third of this cost can be attributed to the decision to re-instate gardens. There were also additional costs incurred in assessing the potential costs and future long-term liabilities of removing established trees. It is estimated that the final cost of remediating all 27 gardens will be in the region of £1 million.

8.3.9 Communication of Risk and Remediation

Throughout the process, the Council communicated with the residents to inform them of the progress in relation to the identification and remediation of the gardens. The Contaminated Land Officer and the Environmental Health Officer for that area arranged numerous 'out of hours' visits to talk to individual residents about the requirement to undertake the works and provide details about how the works will be undertaken.

"This form of communication places a strain on already overstretched resources but has enabled the local authority to accurately dispel some of the fears that the residents may have had. Other forms [of communication] such as letters, telephone, and public meetings can't provide the same opportunity to raise questions and discuss the situation" (Sheffield City Council - EHO)

Many of the affected residents felt that the Council were wasting their time and did not believe that there was a risk to health from the lead in their soil. The potential impacts on property value of appearing on a register were of greater concern.

There may have been some long-term health effects on some of the more elderly residents on the site, although this was not manifest in the blood lead samples.

"Lead is initially distributed in soft tissue, particularly liver and kidney, then redistributes, and is either excreted or accumulates in bone. In adults over 90% of the total body burden is found in bone, where it is largely inert. However, the smaller liable fraction in bone can maintain blood levels after exposure has ceased" (DEFRA, 2002d:3)

However, it is not possible to prove that exposure has had a detrimental effect on a person's health without long-term studies or the person's willingness to perhaps submit a sample of bone. Indeed, a person may take significant offence, should they be asked to participate.

Due to the fact that enforcement action was not required the Council did not serve any Remediation Notices. A Remediation Statement has been prepared which provides details of the investigation works and the remediation works undertaken in garden areas. This information has been placed on the contaminated land remediation register held by the Council in accordance with S.78P of the Environmental Protection Act 1990.

8.3.10 Effects on Resources

The management of this project has effectively required one person full time to deal with the planning, tendering process, complaints, telephone enquiries (by residents, internal staff and media) and to oversee the project. This responsibility was divided between two officers. This has had a significant knock on effect in terms of the effective implementation of the contaminated land strategy, which is likely to take an additional two years to gather all the necessary information with which to prioritise all sites. There are also 'knock-on' effects, such as not being able to meet internal response targets in relation to contaminated land consultations with the Planning Department.

8.3.11 Summary

This case study has identified the dilemmas faced by one local authority in determining land as contaminated land. The site specific data obtained from the site suggested that significant harm was not being caused to the residents on site, which is why the residents felt that the Council and the Government were wasting resources. However, there was the significant potential for significant harm, given some of the lead concentrations in the soil.

There are considerable delays in obtaining SCA funding and obtaining the necessary permission to spend the funding before the tendering process and necessary works can begin.

A considerable amount of time was spent by the local authority in dealing with residents' problems and concerns about the remediation process. This places a strain on local authority resources and creates significant knock-on effects on other statutory duties.

The costs of undertaking remediation works in close proximity to existing buildings, other structures and live services are considerable. It may be questioned whether the cost of undertaking remediation in all circumstances is beneficial, especially taking into account the potentially harmful effects of stress that may be placed on an individual.

8.4 CONCLUSION

This chapter has demonstrated the difficulties faced by local authorities in the identification, risk assessment and remediation of contaminated land. The costs of investigating and remediating contaminated land can be considerable. There are difficulties communicating risks from contaminated soil to the 'lay-person'. There are also considerable knock – on effects of implementing Part IIA on other statutory duties. The priority placed on further implementation of Part IIA will depend upon future resources and political importance placed on other statutory duties.

Chapter 9 provides the results of the questionnaire and interview phases of this research.

CHAPTER 9

INTERVIEW AND QUESTIONNAIRE FINDINGS

9.1 INTRODUCTION

This Chapter presents the findings of the focus group, focus group initial questionnaire, Local Authority Questionnaire and face-to-face interviews. Just prior to submitting this thesis a short follow-up questionnaire was sent to local authorities that had participated in the original focus group and interview phase of this research. The results represent a 'snapshot' of local authority progress in preparing for and implementing Part IIA.

9.2 FOCUS GROUP QUESTIONNAIRE

The first phase of the research involved a focus group interview. The interview was undertaken with 9 Environmental Health Officers, 2 Development Control Planners and an Environment Agency Officer. The focus group was largely made up of members of the Yorkshire and Humberside Advisory Council (YAHPAC) Land Sub Committee. Members of this group were Environmental Health Officers with a specialist history in dealing with land contamination for their particular local authority. It proved difficult to identify development control officers willing to participate in the focus group. The purpose of inviting development control officers was to identify whether the introduction of Part IIA would have an effect on the development control process and how the two regimes would interact. The focus group was undertaken on 2nd December 1998, five months prior to the anticipated implementation of Part IIA. A follow-up questionnaire was distributed to those local authorities that participated in the original focus group in October 2003. The findings from this survey are provided at the end of this Chapter. It should also be noted that, as part of the researcher's employment at Sheffield City Council' it has been possible to maintain contact with members of this group and gain anecdotal evidence about their local authority's progress in relation to Part IIA.

The purpose of the focus group was to provide an indicative measure of local authority preparations in relation to the possible implementation of Part IIA. The responses would be used to guide later research undertaken as part of this thesis. Verbatim statements/opinions are reproduced below in italics and confidentiality is maintained.

The interview identified 5 discussion topics for the group to discuss.

The first discussion topic was designed to identify which department with the local authorities represented would be responsible for implementing Part IIA. This discussion topic also sought to identify what information was already available to local authorities and how it would be interpreted and stored.

The second discussion topic related to the way in which information would be used as part of a wider prioritisation strategy, and the confidence levels required before investigating potentially contaminated land.

Groundwater and controlled waters were discussed as part of topic three. The purpose of this discussion topic was to try and identify the relationship between local authorities and the Environment Agency in relation to the regulation of contaminated land and special sites.

Discussion topic four presented a potential scenario that could cause conflict between the development control system and Part IIA. There was some uncertainty in the group about which regime would take precedence where a development was proposed.

The fifth discussion topic was a review of the potential cost of producing and implementing a strategy. The response to this discussion topic was unanimous, as none of the authorities represented had identified a potential cost or likely time scale for implementing a strategy. The consensus at the focus group was that there would be no additional staff or resources made available from their respective local authorities to implement this duty, and that the responsibility would be distributed to existing staff.

9.2.1 Discussion Topic One

S.57 of the Environment Act requires local authorities to inspect their areas for the purpose of identifying contaminated land in its area. There is now some funding which has been made available by DETR to undertake this statutory obligation. Nevertheless there are several practical implications for local authorities. The draft guidance (and the revised draft guidance) requires local authorities to prepare and implement a strategy within 15 months of the guidance coming into force. The first stage seems to be identifying which local authority officers will be responsible for identifying potentially contaminated sites

9.2.2 Issues to be Addressed

I. *Do you see it as a primarily Planning or Environmental Health role?*
II. *Who will carry out what duties?*
III. *What information is available?*
IV. *Is the information accessible and easy to interpret?*
V. *How will information be stored and who will have access to it?*

Responsibility for undertaking the initial search for contaminated land was divided between environmental health and planning services.

"We decided that we see it as an Environmental Health role we see an extension to statutory nuisance provisions basically and the arguments that we make in fact if you look at where the section falls it falls dead at where the statutory nuisance section ends. So we are making claims to keep it and try and divulge it from the planning development sort of contaminated land role where they are only really getting involved when there is a change of use and bringing in another use on site."

"We've seen planners as having information within their existing control and also people like mining advisory service as people who would do that initial trawl."

"One of the ways that we looked at it is in terms of the planners perhaps taking the strategic role but with a lot of input from ourselves in environmental health. We've not seen it as all going one way and then all coming back another way.

There was concern about ownership of the information due to the internal market system. It was felt that in some cases a department may be unwilling to share information with another department because they bought/owned the information. One participant stated:

"There is a definite air of we want the IT system that you have got so that we can obtain information from it. This is turning out to be a stumbling block as our EH officers are expected to lead the contaminated land regime but...they [Planning] want to own and control the database."

Some of the local authorities represented identified a lack of internal co - operation in looking at contaminated land issues and the need to set up a working committee to determine roles in relation to Part IIA

"It's surprising when you are trying to assemble data - you expect there to be a great deal, from building control, planning, architects etc., once you start asking for it they tell you that we can't possibly retrieve it"

"All our officers have taken early retirement"

There did appear to be common consensus that the information would be stored on GIS. The main concern was who should have access to this information. The Environmental Information Act 1992 creates the possibility that information held on the GIS may need to be provided to interested parties when requested. There was concern about the accuracy of information stored on the GIS and potential liability for incorrect information relied on by third parties.

"I really can't see how you can undertake Part IIA unless you have something similar to what was required as part of the Section 143. Carrying out a survey of historic and current land uses and in doing that there is only really one methodology available which is to use GIS...it's the best there is. We actually did this as an authority, but we were always concerned that we should use it because if we were challenged by a developer as to why a piece of land had ended up on the database then we might have to justify that."

The types of GIS software available were discussed along with the possibility of having some sort of generic system throughout Yorkshire & Humberside. GIS systems developed by Arcview, Mapinfo and FastMap were being used by the local authorities represented at the focus group. It appeared that many authorities already had established systems in use and that individual authorities should go their own way in terms of which GIS they purchase.

"There is a decision to be made....do you choose something regional or something that other authorities would use in environmental health say or what your authority would use within its authority across different departments"

Other issues that were discussed in relation to GIS and storing information were, buying in digitised maps to undertake historic site investigation, and potential problems of having large amounts of information that are not very accessible, both internally and externally. In relation to the cost of purchasing maps one local authority representative stated:

"I take a very negative view to all this...we are very much a rural authority so we have a fairly miniscular problem compared with some other authorities and that is perhaps why the authority isn't ready to make such a financial commitment... well its probably a choice between a recycling officer and a contaminated land officer...It's that kind of problem."

9.2.3 Discussion Topic Two

Having identified and collated existing information, what processes can be used to determine the possibility of a site causing significant harm?

9.2.4 Issues to be Addressed

I. *What information is deemed sufficient to make contact with the site owner/ undertake intrusive investigations?*
II. *What risk assessment procedures are being looked at?*
III. *How will potential targets be identified?*

A – *"I must admit I'm a sceptic and I've always said, as far as this legislation is concerned, why is it needed? What is it doing that existing legislation doesn't do now...."*

B – *"I would probably say looking for trouble as opposed to waiting for it to come to you"*

The lack of technical guidance was very much of concern. This is something that the representative from the Environment Agency stated that the DETR and the Environment Agency were trying to address. This would be in the form of additional guidance to support the Statutory Guidance and training days held by the Environment Agency. The group discussed the development of the CLEA model and accompanying guidance.

"Until we get some specifics with some specific guidance then we don't know what we are going to fit in to, what kind of shape we need to know, what sort of beast we are dealing with, where all the knobbles are, and then we can find out how that fits within our organisation"

"[DETR] are bringing out three or four publications... one will be a vast document and it is entitled "Modern Procedures for the Management of Contaminated Land." I believe that is Contaminated Land Report Number 11 and deals with the steps that should be followed...the best practice if you like in terms of site investigation, to risk assessment, to selection of remedial options."

At the time of writing this Chapter (September 2003) the Environment Agency has just issued a draft CLR 11 for consultation, nearly five years after it was promised. The above quote is indicative of the overall policy development with respect to Part IIA documentation and guidance, in that there have been considerable delays before being finally issued.

In relation to potential local authority responsibility when identifying contaminated land, the consensus was that in cases where contamination is suspected it is unlikely that the owner/polluter of the site would agree to undertake any site investigation. This will place the onus back on the local authority to decide what is required in terms of the site investigation, and incur the cost. The practical difficulties of implementing the apportionment and exclusion rules contained with the Statutory Guidance were also discussed.

"I think that it will get really messy. I can think of one or two who will say - the onus is on us to try and get us to do the work and they will quite happily say that until you prove it."

"I think that it's the financial implications of it really. It's a case of wait and see how much it will cost the first authority that actually serves a notice and take it from there"

"There's guidance there as to how you do it but actually how you do it in practice is another matter"

The competency of consultants and the quality of site investigations were highlighted in the discussion. The need to look for clear rationale in terms of sampling strategy and risk assessment in order to determine the potential for significant harm was also discussed. It was stated that the Environment Agency was producing its own internal documents and that local authorities should try and get access to this information.

9.2.5 Discussion Topic Three

In certain circumstances contamination of ground water may be an issue for local authorities. In such circumstances how will local authorities interact with the Environment Agency?

9.2.6 Issues to be Addressed

I. *What information will the Environment Agency give?*
II. *How will that information be used by local authorities?*
III. *Will information from the Environment Agency be relied upon if a consultants report suggests that there is no contamination?*
IV. *What is the legal status of Environment Agency Information?*

"If we have got it and it isn't covered by a confidential status of some sort and we will have to assess the information that we have got for that, then it will all be available"

"There are the provisions for the agency to do the inspection work for you from any site that you suspect might be a special site. So where there is information like that I can see most local authorities will want it straight away because that will make the job a lot easier."

The purpose of this discussion topic was to determine the relationship between local authorities and the Environment Agency. This would be in terms of agreed levels of co-operation and responsibilities. The general consensus that wherever there was an issue with groundwater or other controlled waters the local authority would be guided by the Environment Agency. In addition the Local Government Association (LGA) and the Environment Agency had signed a memorandum of understanding in relation to the exchange of information. At the time of the focus group the Environment Agency had not produced any specific guidance about information they would provide. As it was not clear what type of information would be available, the local authority representatives felt that they could not comment on all the issues to be addressed in this topic. The Environment Agency has now provided local authorities with digitised information and site specific assistance (see results of follow-up questionnaire). If a similar focus group discussion were to be undertaken, it is anticipated that responses to the issues in topic three would be covered in greater detail.

9.2.7 Discussion Topic Four

It is the government's intention that contaminated land is brought back into beneficial use through the development system (Framework for Contaminated Land, 1995). This has implications both in terms of Planning Control and S.57. Where a planning application is received adjacent to a former gas works site and there is significant pressure for the housing development how do local authorities proceed? On the one hand there is political pressure to see housing developed, on the other hand by allowing the development to go ahead are you creating the possibility that the former gas works site could cause significant harm?

9.2.8 Issues to be Addressed

I. *How will information from third parties (developers, consultants) be used?*
II. *How will its quality be assessed?*
III. *How will developments be regulated - will consultants' information be relied upon?*
IV. *If not what are the alternatives?*
V. *Is the legislation likely to favour developers?*

"If we had a suspicion that the site next door has contamination and we identified a development site, would the requirement be for investigation of the site by the developer or would the developer say, no we will wait until environmental health/planning have fulfilled their duties in terms of S.57. Which would take priority?"

It was generally agreed that in the case of a planning application the contamination would be dealt with during the development, and the onus would be on the developer to prove that satisfactory works had been undertaken. The verification methods and the confidence that local authorities placed on these were also discussed.

"There appears to be a range of approaches. There is one authority actually where they just put it in the appropriate planning file. They just send a letter out saying,.. right you said that it will work. It is your responsibility now - we don't do that. But the main problem that I have come across is, as you say, over the last few years there are a lot of people trying to get into this market without any proven track record. There is one example of landfill gas escaping from a scrap yard. He got himself a gas meter and he was offering his services about the place - its actually very difficult to refuse such applications"

"I think that one of the big problems that local authorities have - is getting the kinds of conditions on planning consents, or even before they get planning permission, is to get the right sort of information and where conditions are put on, that they are appropriate to the kind of land use and the kind of decontamination that needs to be done."

"We had one where we've got the conditions on. But we were worried because we went back to the site and the houses have been built and we haven't got any report and we don't know what the land is like. It may not be contaminated, but there again it may be very badly contaminated"

Lack of confidence in reports and site investigations was highlighted by one participant due to differences in approach:

"What bothers me is that I went to a British Geological Survey presentation a month a go and every time a chemist stood up he slated the consultants and then the consultant stood up and slated the chemist. I'm neither and I'm going to have to make decisions based on information from those people"

Resources were seen to be a major issue, as local authority officers did not have sufficient time to inspect sites during remediation.

"My concern is that we are in danger of shooting ourselves in the foot once again. The government is going down the line that we have got to provide all this extra housing and they are going to be principally on brownfield sites. Now who is going to buy a property on a brownfield site?... Nobody... and to what degree of remediation has work been undertaken? Just because it is at today's standard, in 20 years time that might not be acceptable. The landowners, as I understand it under these new regulations that are coming out, are going to be liable, so if you're a homeowner and there is something in your garden, you are going to have to clean up that land and that is going to be a very expensive business"

9.2.9 Discussion Topic Five

Have any authorities looked at the cost of producing and implementing a strategy?

9.2.10 Issues to be Addressed

I. *Who?*
II. *How much?*
III. *Who responsible for what?*
IV. *What timescales?*
V. *What methodology have you used to determine whether a site presents a significant risk of being contaminated?*
VI. *How much land in your area would you estimate may be contaminated within the legal definition?*

The focus group indicated that on the whole there had been very little work done in preparation for the implementation of S.57. Reasons for this were blamed on lack of time and also a lack of political will from heads of departments. This is perhaps to be expected with the delay in actually implementing the legislation.

"The answer to your question is "no we haven't" and while we might think that we have made some progress, I think in practice we haven't and I think that is really political. I get the distinct impression that although I try to get things moving I tend to get the impression that higher level managers don't want to do anything. I rather suspect that this is one of these issues that people will leave. And it won't rise up the political agenda as there are no resources, no commitment to do it and no actual enthusiasm any higher to raise the issue."

"It strikes me that there should be a generic strategy for Yorkshire - you know what I mean otherwise we are all going to be reinventing the wheel"

Of the local authorities represented at the focus group none had identified likely cost implications.

There was a general consensus amongst the group that there are not likely to be many sites identified as contaminated land.

"Significant harm - I would like to think that any sites that are known about have been dealt with under existing legislation."

"You have to set on somebody specific to do the trawl through all the land in the district. They are going to come up with land that falls into various categories which really gives you the opportunity for ranking land... to intervene and say we'll call all the land in X purple. When you get to the end of that have a look at sensitive uses and when we'd finished we had about five or six sites"

A discussion between some of the participants revealed that one authority had identified one site already

A – "I have heard it quoted once that the number of sites Sheffield had already estimated to cause significant harm within the city boundaries was one"

B – "And that's been cleaned up now, that one. (laughs). But we found another one though this week, but we're best off in the single figures though."

C – "The problem is that you may keep finding that other one...It's just the right sort of amount that you can deal with."

Some local authorities felt that they may be put under unnecessary political pressure to investigate sites as a result of pressure groups

"There is another can of worms, in that I feel the greatest pressure to implement this legislation is going to come from local pressure groups who are going to be concerned with the residential sites rather than the industrial ones. There will be the ones who discover that their home is built on a former contaminative use and they want some assurance from the authority that we have looked at the site pursuant to the legislation"

9.2.11 The Focus Group Additional Questionnaire

At the end of the focus group a questionnaire was handed to each of the participants. The participants were asked to identify the most important issues and concerns relating to the future regulation of contaminated land. Twenty spaces were provided so that issues of importance could be ranked. Only two responses were not received, these were from the development control Officers who felt that they did not have sufficient expertise to respond. The responses to the questionnaire are ranked in order below:

1 Lack of technical guidance
2 Financial implications
3 Resource implications
4 Confidence in site investigations
5 Enforcing S.57 legal complexities
6 Establishing roles of Environmental Health and Planning
7 Relationship of official and unofficial registers
8 Remediation decisions
9 Reliability of consultants
10 Consistency of approach by authorities to S.57.

Other issues identified liabilities for council owned contaminated sites; water pollution issues; cost of GIS systems; and poor liaison with the Environment Agency.

9.2.12 Focus Group Summary

The purpose of the focus group interview and additional questionnaire was to identify the pertinent issues faced by local authorities in preparing for the implementation of Part IIA. The results of this phase of the research suggested that local authorities had started the process of establishing internal communications between departments and establishing who would be responsible for implementing Part IIA. At this stage of the research none of the authorities had identified an actual cost for producing a strategy and implementing Part IIA. Resources and the need for new technical guidance to be published were perhaps the most critical factors for local authorities. Without additional resources the local authorities represented at the focus group did not feel that they would be able to fully implement Part IIA. The consensus appeared to be that data would be stored on a GIS. The choice of GIS software would depend upon existing systems and compatibility with other internal departments.

The consensus was that further guidance was required before decisions could be made about how to assess whether land was *contaminated land.* The fact that funding for implementing Part IIA was not ringfenced and included as part of the overall standard spending assessment was identified as a barrier to effective implementation. The group identified that there were potential conflicting issues relating to the interaction of Part IIA and the planning process and that the DETR should issue new planning guidance at the earliest opportunity.

The findings from the focus group stage of the research were an indication of how local authorities were preparing to implement Part IIA. It was originally anticipated that another focus group would be held six months after the initial focus group to identify progress and identify developing issues. However, due to the delays in implementing the legislation, the local authorities felt that they

could not contribute any further to the research at that point as no progress had been made since the first meeting.

9.3 QUESTIONNAIRE SURVEY

The Second Phase of the study involved a questionnaire survey undertaken in July 1999. The purpose of the questionnaire phase was to develop some of the ideas and themes identified from the focus group. The questionnaire was designed to identify what stage local authorities had reached in preparing for the implementation of Part IIA and whether the findings of the initial focus group also applied to other local authorities in England. It would also enable some statistical data to be collected about local authority activity in relation to part IIA as well as providing access to other potential participants for the interview phase in the latter part of the research.

The questionnaire was sent to 150 local authorities. The sample was sent to just less than half the total number of local authorities in England (354) and these were chosen selectively in order to get a reasonable spread of different types of local authority in England. The split between authorities was as follows:

- 20 London Borough authorities
- Unitary Authorities
- 120 district and borough councils that were divided further into those that were perceived to be smaller urban or rural authorities, and larger urban and rural authorities.

The response rate to the questionnaire phase was 48%. The failure to achieve a higher response rate was seen to be the result of a number of factors. First, due to delays in issuing the proposed Statutory Guidance; second due to a similar postal survey which was sent to all the local authorities in England just weeks earlier, with the support of the Chartered Institute of Environmental Health; and also due to the timing which co-incided with 'summer holidays'.

The response rate compared favourably with other researchers in the field e.g. Dunn, 1997 at 44.6%, Parkinson in July 1999 at 57.4% and Woodcock 2000 at 42%.

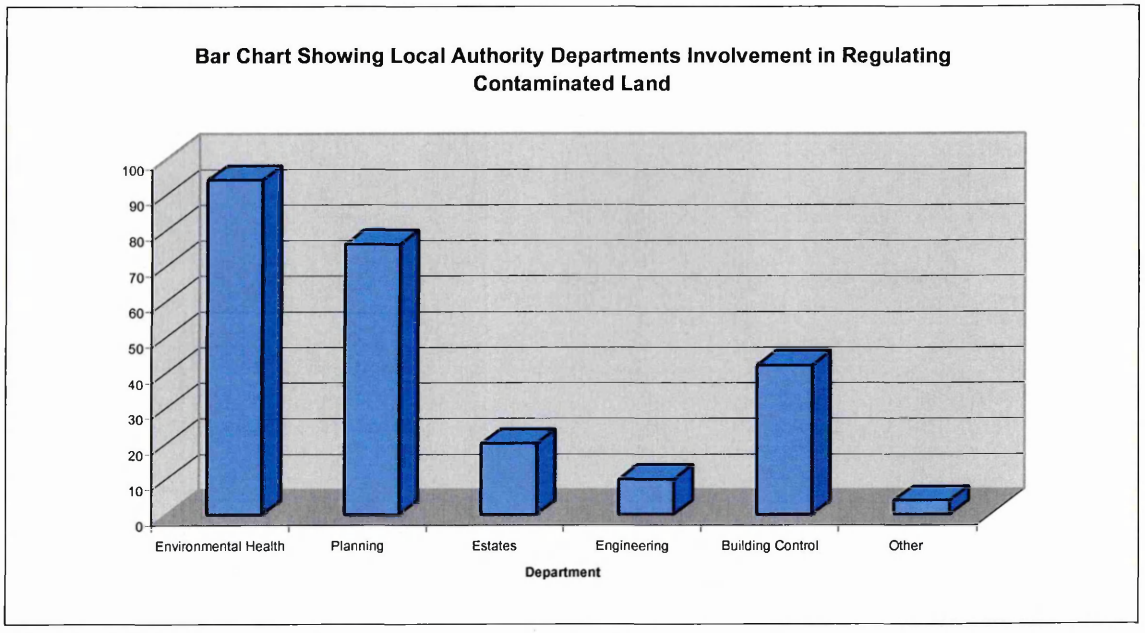
Table 14 Response Rate by Local Authority Type

Type of Local Authority	No. Returned	No. of LA's Sampled by Type	Response Rate (%)
London Borough	6	20	30%
District/Borough	62	120	51.6%
Unitary	4	10	40%
Total	**72**	**150**	**48%**

9.3.1 Questionnaire Survey Results

1. Which departments have a role in regulating potentially contaminated land in your local authority?

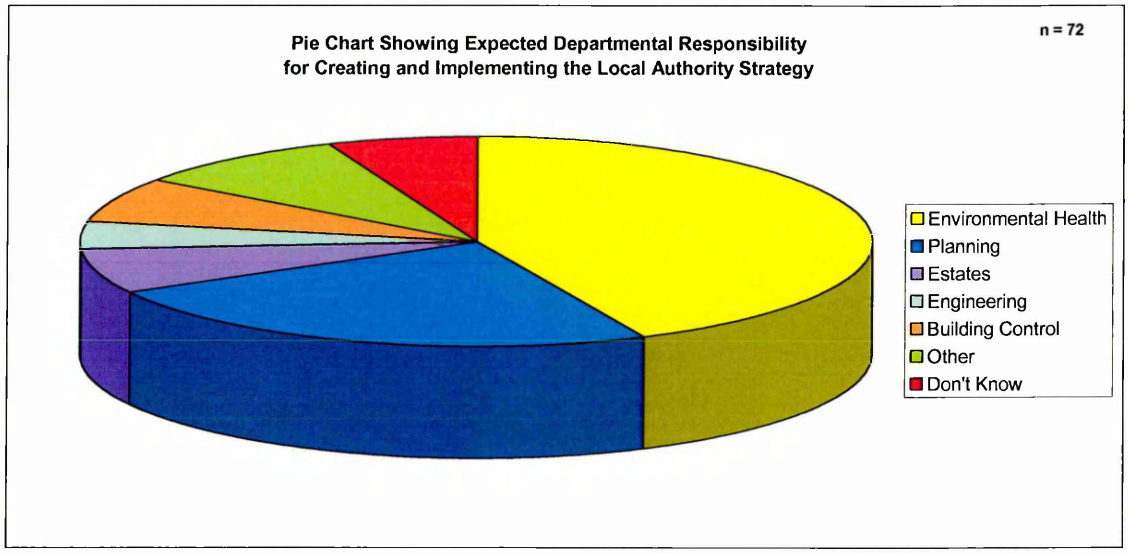
n=72



The results of the questionnaire revealed that the greatest level of involvement in regulating contaminated land was with the Environmental Health Department. Other significant involvement was by the Planning Department and Building Control.

2. Which department(s) will be responsible for creating and implementing your local authority's strategy to implement S.57 and what will be their role(s)?

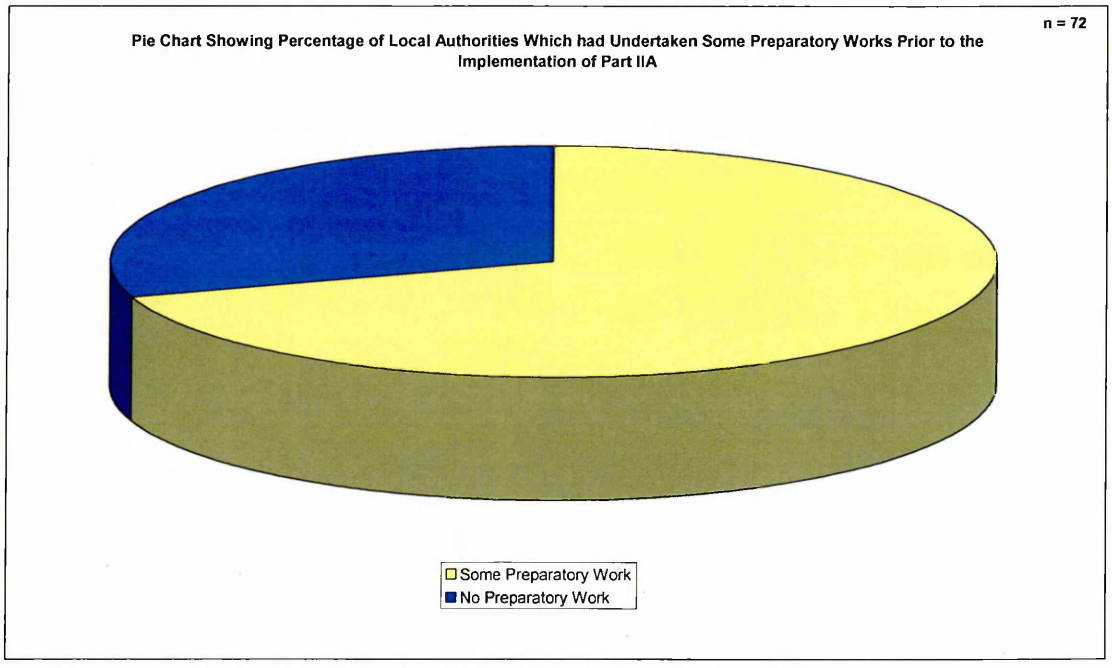
n =72



The results for this question revealed that nearly half of the authorities that responded to the questionnaire expected that the Environmental Health Department would be responsible for creating and implementing the strategy. Nearly a quarter felt that the Planning Department would lead on the Strategy. There were a significant proportion of local authorities that ***didn't know*** which department was going to take the lead role.

3. Has your local authority undertaken any preparatory work in preparation for S.57?

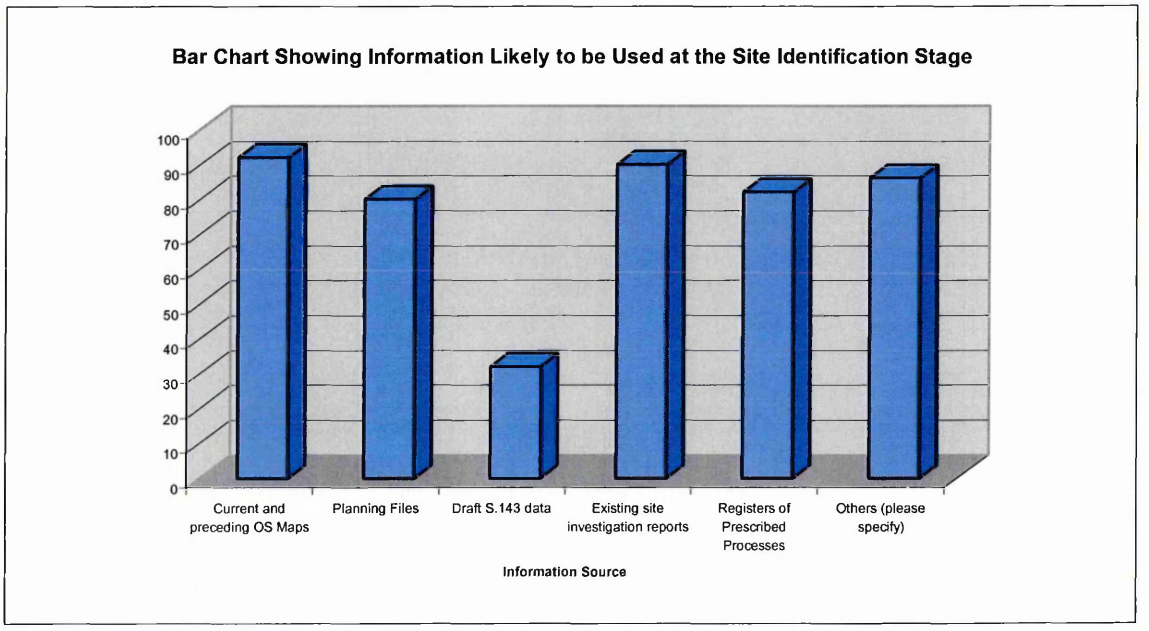
n = 72



Responses to the above question identified that nearly three quarters of respondents had started some preparatory works. About 10% of these respondents provided annotations to their responses that suggested that the amount of preparation was minimal.

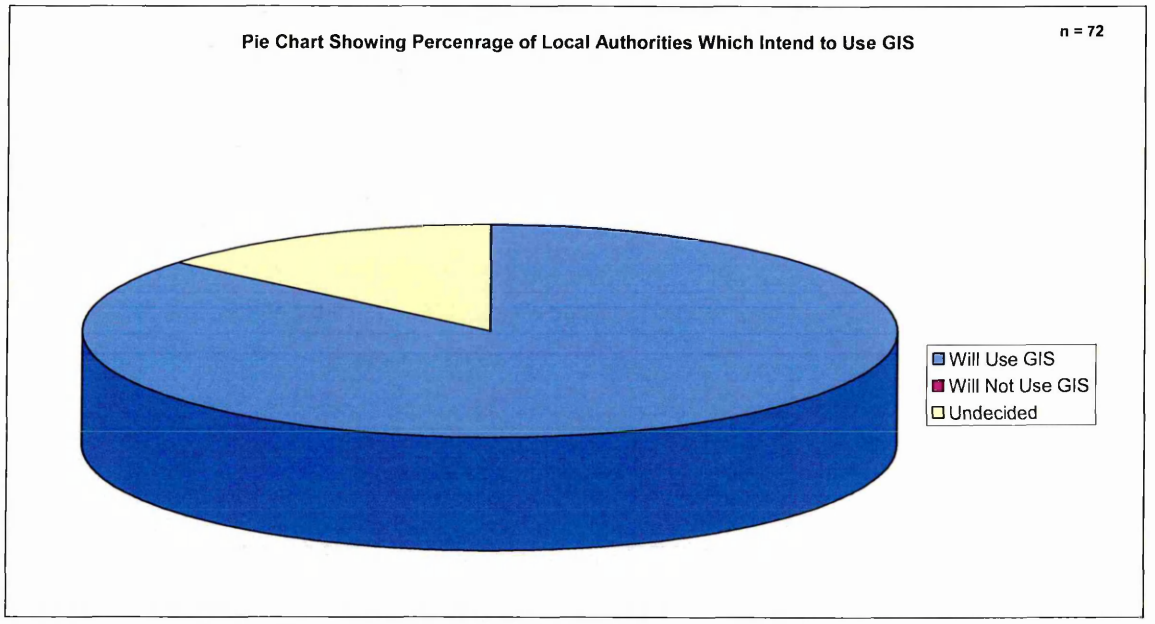
4. *What information will be used in order to assess a site's potential to be contaminated?*

n=72



The purpose of this question was to try and identify the types of information held by local authorities. The results of the questionnaire identified that only a small proportion of the respondents held information gathered in preparation for the S.143 registers. There was a consistent approach in terms of the other information used. Where 'other' had been ticked, the majority of the respondents stated that they would use datasets provided by 'Landmark' and also the Kelly's Trade Directories.

5. *Will this information be stored using a GIS system?* n=72



Responses to this question identified that 95% of the local authorities that returned the questionnaire would use a GIS for storing their contaminated land data. Of the 5% that were undecided, the reason for this was either lack of provision in the budget or potential technical difficulties of updating an existing system.

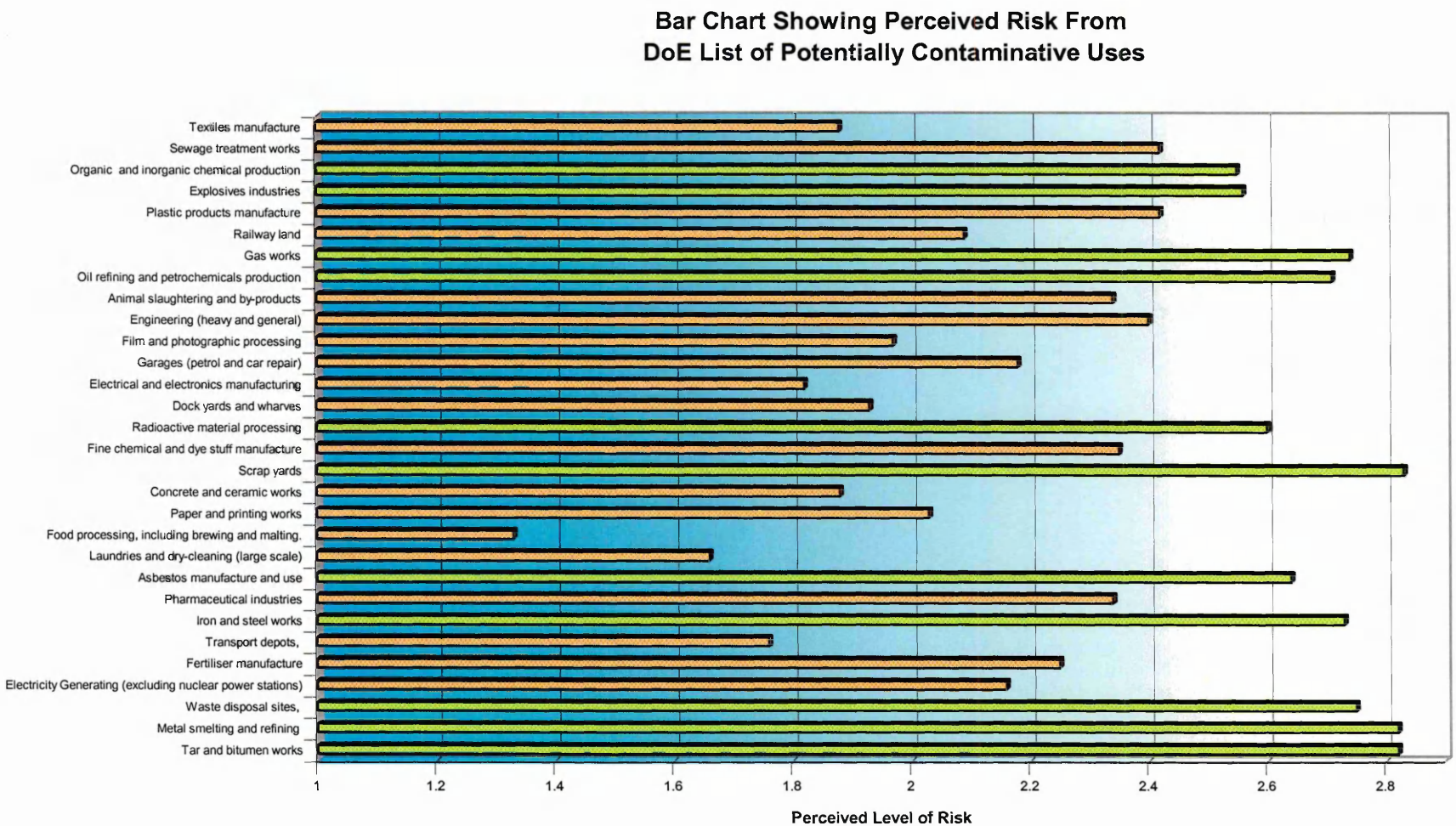
Which of the following previous uses would your local authority classify as having the greatest potential to cause 'significant harm'? Please rank each previous use on a scale of 1 to 5. Where 5 is considered to pose the most significant risk and 1 the least significant risk[1].

n=49

See Bar Chart on the next page.

[1] The questionnaire asked respondents to rank sites where 1 represented the most significant risk and 5 represented the least significant risk. However, for presentation purposes the scores have been weighted to show those industries with the greatest perceived risk.

Question 6 – Bar Chart Showing Local Authority Perception of Industries with the Greatest Potential to Cause Significant Harm



This question was based on earlier work that was done by Syms (1999) relating to perceptions of risk given to different previous land uses. The purpose of this question was to identify how local authority Officers responsible for implementing the contaminated land strategy might prioritise land on the basis of their former use. The work undertaken by Syms (1999) used 39 potentially contaminative land uses. This question used 30 industries in order that respondents were not discouraged from completing the question due to other time constraints. Analysis of the responses revealed that scrap yards were seen as the highest risk followed by metals and metal refining works and tar and bitumen works. In terms of overall potential risk the results obtained from this question are comparable with the hazard rank assigned to the different industries by Syms (1999).

7. Are the previous use(s) which you have classified as having the greatest potential to cause significant harm those for which your local authority is most likely to require a site investigation?

Responses to this question identified that only 35% of local authorities felt that the industry they perceived to present the greatest hazard would not be the sites that their authority would necessarily identify as having the greatest potential for significant harm. Respondents were provided with a space on the questionnaire to provide reasons for their response. A variety of reasons were provided for example:

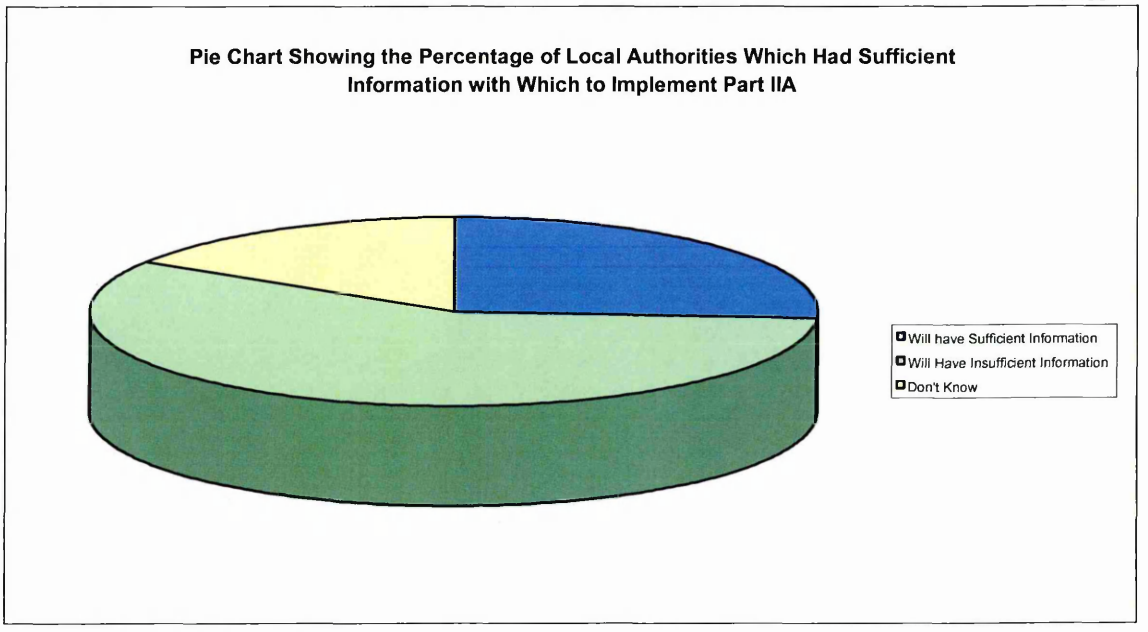
"*We don't have any tar works*"

"*These are the industries I feel present the greatest risk, based on perception – they are not necessarily the ones that will be causing significant harm*"

"*We would need more information about the past histories of individual sites etc.*"

8 *Will the information that is presently available to your local authority be sufficient to enable a decision to be made relating to the sites potential to be contaminated?*

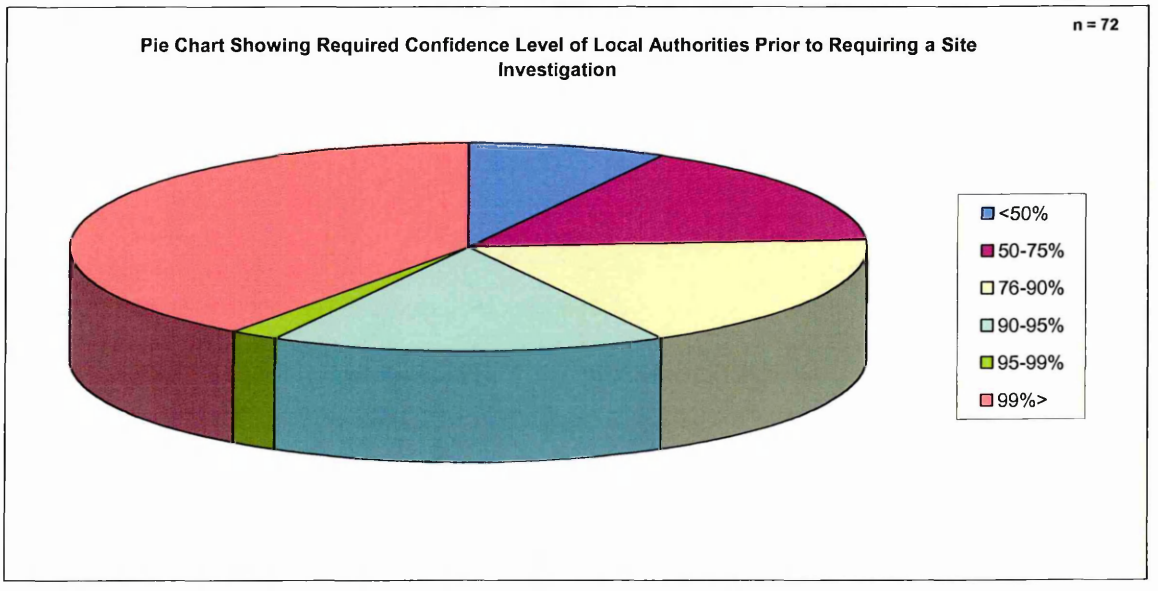
n=69



Responses to this question revealed that a quarter of local authorities had all the information they required to implement Part IIA, with nearly two thirds of local authorities stating they had insufficient information. The remaining respondents did not know whether they had sufficient information.

9. *What confidence level would your local authority require before requiring a site investigation?*

n=72

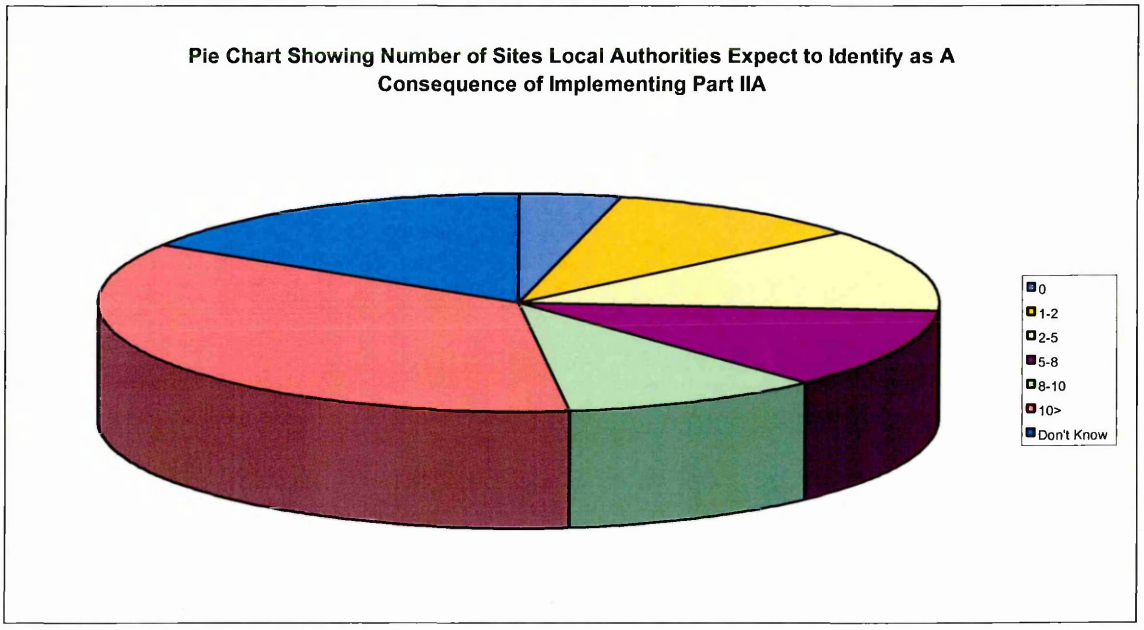


The purpose of this question was to identify how cautious the local authority approach may be in relation to taking regulatory action. The responses

indicated that nearly one-third of local authorities would require a confidence level of greater than 99% before requiring a site investigation. Interestingly nearly a quarter of respondents felt that they would require a site investigation even though they were less than 75% confident that the land was possibly contaminated land.

10. How many sites in your local authority area would you estimate to be contaminated within the legal definition?

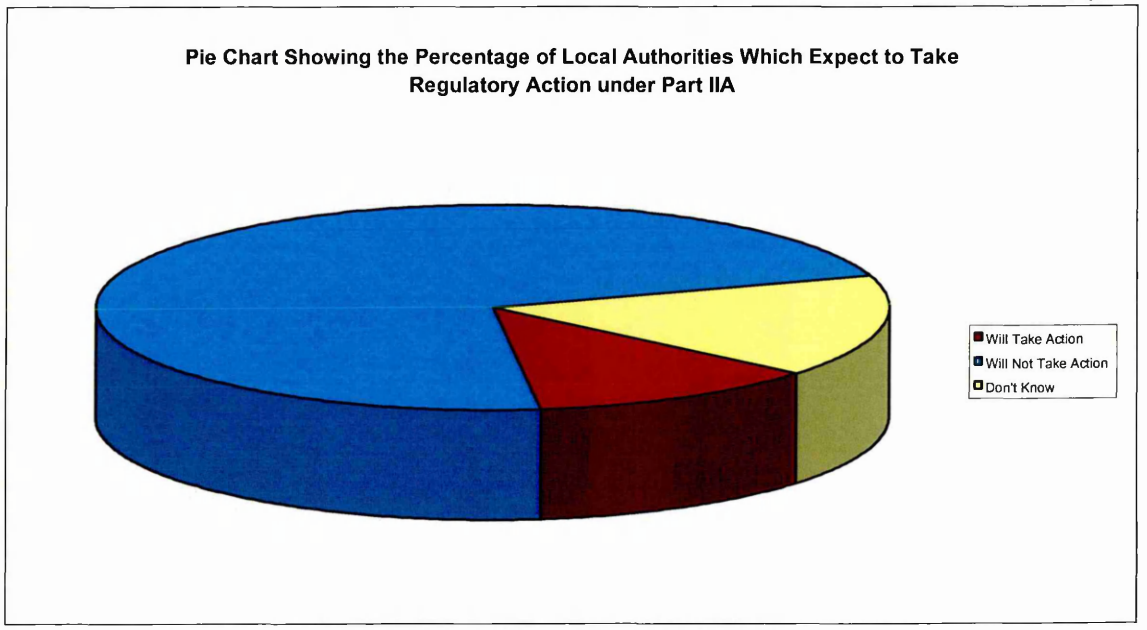
n=69



Nearly one-third of respondents felt that they would identify more than 10 sites as a consequence of implementing Part IIA. A quarter of local authorities indicated that they expected to identify less than 5 contaminated land sites.

11. ***At the present time do you feel that your local authority will ever take any regulatory action against a landowner/polluter based on the initial desk top study which will be undertaken to inspect your area for the purpose of identifying contaminated land?***

n=69



The response to this question was somewhat surprising, given the results in the previous question. Even though 33% of local authorities estimated they would identify more than 10 sites capable of been determined as contaminated land, only 10% felt that would take regulatory action. 75% of respondents felt that they would not take regulatory action. It is therefore assumed that the majority of local authorities anticipated that the majority of sites would be remediated voluntarily either as part of the development control process or to avoid the threat of regulatory action.

12. ***Do you expect that the CLEA (Contaminated Land Exposure Assessment) model and accompanying guidance will assist your authority in identifying contaminated land?***

85% of local authorities stated that the CLEA model and accompanying guidance would assist their authority in identifying contaminated land. Annotations by a number of respondents to this question pointed the researcher to Question 13 and the need for additional resources. The remaining respondents stated that they 'didn't know'

13. What additional resources, if any, will your local authority require in order to implement S.57?

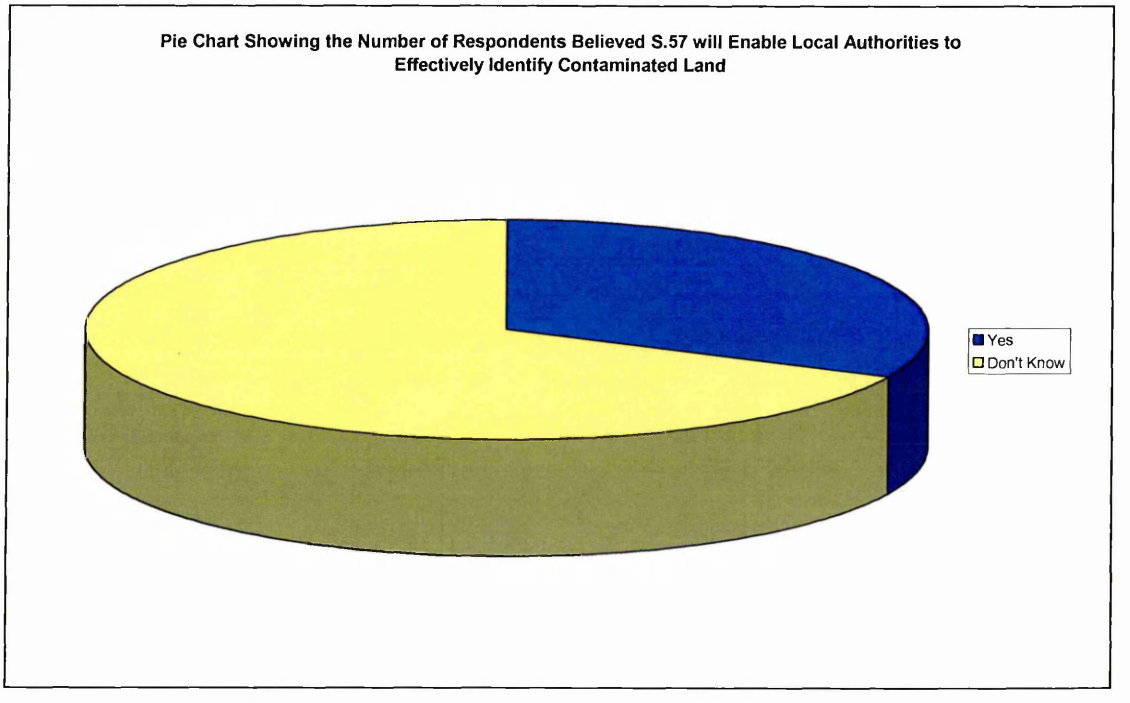
n=20

85% of the responses identified a requirement for additional staff. 45% identified a requirement for investment in information technology and software to store data collected as a result of implementing their strategy.

14. *Has your local authority identified a cost to implement the provisions of S.57?*

Only a small proportion of local authorities (14%) that responded to the questionnaire had identified an estimated or actual cost to implement the provisions of Part IIA. These costs were based purely in terms of additional staff and investment in computer software and digitised datasets. The average cost to implement the strategy was £35,000pa. The minimum being £15,000 and the maximum £120,000. The differences can be attributed to a number of factors, the size of authority, existing staff, existing data and proposed timescale for implementing the strategy. None of the estimates included provision for further site investigation and remediation costs.

15. Will S.57 enable local authorities to effectively identify contaminated land with its area?



Most local authorities (75%) felt that Part IIA would enable them to effectively identify contaminated land. The respondents were asked to provide reasons for their answers. Typical responses are reproduced below and have been grouped to identify potential problem issues, and positive aspects in relation to Part IIA

9.3.2 Potential Problem Issues

Availability of Information

"*There is enough historical/current data available to identify land that is/ maybe contaminated.* ***It is those areas which may not have known uses that may slip through the net – we need to be aware of this problem***"

Resources

"*It all depends on the identification of resources and their effective allocation and use*"

"*Inadequate resources, other equally important priorities competing for funding*"

"*Legislation does not provide the right result unless fully funded (& ringfenced funded)*"

"*The legislation provides a statutory framework permitting work to be published without concern for blame for causing blight. It ought to have made resources available*"

Timescales

"Comprehensive study required as follow on to strategy – will take several years"

Liability

"Legal problems associated with previous uses and contamination"

"*Not sure how successful clean-up operations will be with unhelpful landowners, absent landowners and unclear legal procedures*"

"*Concerns regarding political pressure and blight of land must be dealt with*"

Lack of Guidance

"Discussions with the Environment Agency about a particular development have been difficult due to current lack in clear risk-based decision making process for the identification of remediation techniques"

"The whole thing's as clear as muck"

"PPG 23 needs amending to dovetail with S.57"

Estimated Number of Contaminated Land Sites

"Only a small proportion of contaminated sites are likely to meet the S.57 definition."

"As this is a rural area, there may be sites that are not known about or where there are no longer details of planning history. All the laws in the land are not going to deal with that"

"Most areas already known"

"Statutory definition is too narrow"

"The definition of contaminated land is so narrow as to preclude action being taken on most sites initially identified; once sites are identified there will be difficulties in determining the persons responsible and then getting those persons to carry out remedial works. Where contaminated land is identified, it may lead to a significant financial burden on the authority"

9.3.3 Positive Responses Relating to Part IIA

"It will actually make us formalise records even if the majority of sites do not get designated as actually contaminated we will have gathered information about them"

"The impending legislation is raising awareness of the potential for contamination among LA's and also among many developers and house buyers. Many sites will be investigated through planning when developed. The introduction of the legislation and the provision of funding will help LA's carry out extra investigations"

"The risk based assessment will assist in identification and prioritisation of sites."

"So far as Part IIA is concerned the definition of contaminated land is relatively narrow. As a consequence of this I do not anticipate that this will pose any major problems"

"We have knowledge of a vast number of potential sites. The risk assessment criteria will allow for categorisation of the most likely sites to cause future problems/ require remediation."

It would therefore appear from the responses above that most local authorities felt that Part IIA would be beneficial in promoting consistency in the risk assessment process. It would also enable them to gather information to assist in the assessment of risk on previously used sites developed as part of the planning process.

16. ***There have been a number cases where similar developments on previously used sites have been dealt with very differently in terms of contamination by different local authorities during the planning process. Do you agree that the introduction of a new risk based framework in the form of S.57 will increase consistency among local authorities?***

100% of the local authorities that responded to the questionnaire believed that S.57 would increase consistency among local authorities.

9.3.4 Summary of Questionnaire Phase

The results of the questionnaire concur with the findings of the earlier focus group interview and provide some evidence of progress in relation to some local authority preparations prior to the implementation of Part IIA. It appears from the results of the questionnaire survey that individual local authorities had begun the process of deciding which departments would be responsible for implementing Part IIA. Indeed, three-quarters of the local authorities indicated that they had undertaken some preparatory work. Local authorities had started to look at the information that they hold and ways in which this could be stored in the future. The vast majority of the respondents indicated that their preference was to store the information they gathered on a GIS.

9.4 REVIEW OF STATUTORY GUIDANCE CONSULTATION RESPONSES

Walsall MBC estimated that they would have 60 sites (a conservative estimate) that would need investigation as contaminated land, and were concerned about the financial implications. Concerns were also raised about the ability of a

magistrate's court to deal with appeals against a remediation notice, due to the technical nature of the arguments that may be brought. At the time of writing this thesis Walsall have yet to formally identify any land as 'contaminated land'.

Interestingly the response from Wyre Forest DC suggested that the regime would not affect them from a resources perspective. This response may have been based on an assumption that their area would not reveal any contaminated sites, but would never the less have to be inspected.

Other significant comments related to the narrow definition of contaminated land and the lack of any significant technical guidance. One consultee, Warrington BC, suggested that the technical guidance should be provided before the legislation was implemented. Another suggestion from the Architects and Surveyors Institute related to the idea of "extending the powers of the Town & Country Planning Act". They suggested that there should be a requirement for a ground report on every new development site and that new legislation should concentrate on special sites that would have been controlled by the Environment Agency.

The response on behalf of Sevenoaks District Council suggested that the psychological impact on residents should also be taken into account where contaminated land is concerned.

A response by RJB Mining (UK) Ltd related to controlled waters and suggested that the "concept of seriousness (or significance) of pollution of controlled waters is introduced into the legislation"

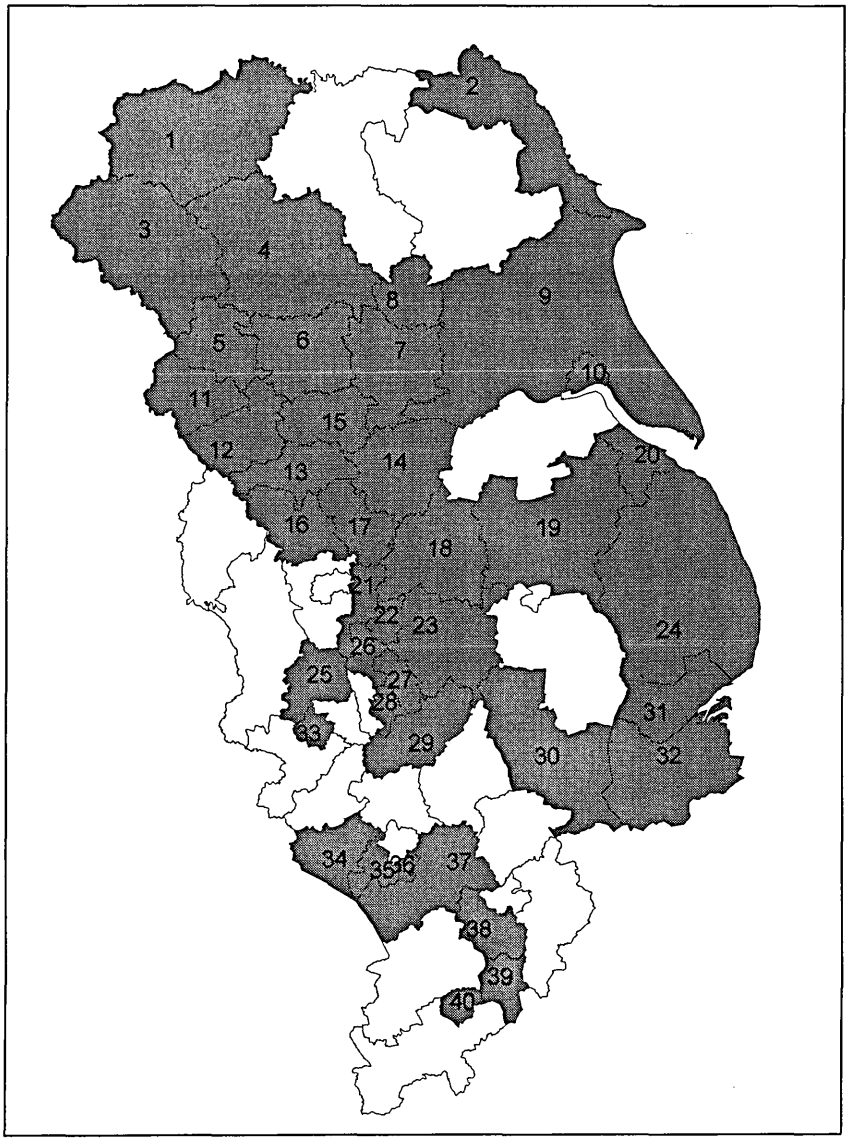
Cllr Irene Farey on behalf of the Dorset Federation of Residents' Associations stated that the timescales for identifying contaminated land should be clarified and shouldn't be left to individual local authorities. In addition she was concerned about potential liabilities to homeowners. The issue of timescale was also raised by Shropshire County Council and they recommended it should be linked to additional resources in order to avoid the potential for blight.

Other comments related to the potentially complex method for apportioning liability, and concerns were expressed relating to potentially costly legal challenges against remediation notices.

9.5 SEMI-STRUCTURED INTERVIEW FINDINGS

Following the implementation of Part IIA on 1st April 2000 an interview phase was undertaken between July 2000 and August 2000 involving a total of 40 Local Authority Officers in the Yorkshire and Humberside and East Midlands Regions who were responsible for the implementation of Part IIA. The interview questions were designed to allow a comparison with the earlier focus group interview and subsequent questionnaire survey. The purpose of the interview phase was to identify further developments in local authority preparations following the implementation of Part IIA in April 2000. The use of a semi-structured interview enabled specific questions to be asked of the research participant in relation to Part IIA whilst still enabling the participant the opportunity to expand upon their answers. The questions provide some quantitative and qualitative findings that can be compared with the earlier questionnaire and focus group interview. Figure 33 shows the local authorities that participated in the interview phase undertaken in July – September 2000.

Figure 33 Map of the Yorkshire and Humber and East Midlands Regions Showing Local Authority Participation in the Interview Phase.



Key

RICHMONDSHIRE DISTRICT	1	BOLSOVER DISTRICT	21
SCARBOROUGH DISTRICT	2	MANSFIELD DISTRICT	22
CRAVEN DISTRICT	3	NEWARK AND SHERWOOD DISTRICT	23
HARROGATE DISTRICT	4	EAST LINDSEY DISTRICT	24
BRADFORD DISTRICT	5	AMBER VALLEY DISTRICT	25
LEEDS DISTRICT	6	ASHFIELD DISTRICT	26
SELBY DISTRICT	7	GEDLING DISTRICT	27
YORK	8	CITY OF NOTTINGHAM	28
EAST RIDING OF YORKSHIRE	9	RUSHCLIFFE DISTRICT	29
CITY OF KINGSTON UPON HULL	10	SOUTH KESTEVEN DISTRICT	30
CALDERDALE DISTRICT	11	BOSTON DISTRICT	31
KIRKLEES DISTRICT	12	SOUTH HOLLAND DISTRICT	32
BARNSLEY DISTRICT	13	CITY OF DERBY	33
DONCASTER DISTRICT	14	HINCKLEY AND BOSWORTH DISTRICT	34
WAKEFIELD DISTRICT	15	BLABY DISTRICT	35
SHEFFIELD DISTRICT	16	OADBY AND WIGSTON DISTRICT	36
ROTHERHAM DISTRICT	17	HARBOROUGH DISTRICT	37
BASSETLAW DISTRICT	18	KETTERING DISTRICT	38
WEST LINDSEY DISTRICT	19	WELLINGBOROUGH DISTRICT	39
NORTH EAST LINCOLNSHIRE	20	NORTHAMPTON DISTRICT	40

The number of regions was limited due to various time constraints and financial implications associated with undertaking a wider survey. Forty local authority representatives agreed to participate in this phase of the research. It is argued that these local authorities provide a wide spread in terms of land-use (past and present), size, population, political control and economic regeneration. Lack of progress with the implementation of Part IIA meant that a number of local authorities did not want to participate, either because they had "*done nothing to talk of*" or couldn't spare the time to be interviewed due to resource constraints and other priorities. The Interview phase also included interviews with all the original members of the focus group discussion. Verbatim responses and opinions are reproduced in italics and anonymity is maintained.

The first interview question asked the participant to describe his/her local authority area in terms of geographical size, population and past industrial history. As anticipated there was a broad range of local authorities represented in this study from large urbanised industrial towns and cities to small rural local authorities with limited past industrial history. This interview phase identified that there were a number of common threads between individual industrialised towns and cities. There were also a number of common themes that were applicable only to the more rural authorities. There were some important issues that were common to all the local authorities that participated in the interview phase that may have implications in relation to the future success of Part IIA.

The second interview question sought to identify the research participant's knowledge and experience in relation to contaminated land. The majority of those interviewed identified themselves as Environmental Health Officers or Scientific Officers who had taken a lead on contaminated land issues. There were three authorities that had appointed specialist Contaminated Land Officers to implement their strategy at the time that this interview phase was taking place. There were two authorities where the person who was going to be responsible for implementing had no previous experience.

9.5.1 Responsibility for Part IIA

Responsibility for developing the strategy was identified as being primarily the role of the Environmental Health Department. Only two local authorities indicated that the Planning department would be taking the lead. Whilst Environmental Health would take the main role in terms of developing the strategy, it appeared that the Planning Department would be heavily involved in developing the GIS in the early stages in eight local authorities.

9.5.2 Information

Approximately 80% of the local authorities interviewed had undertaken a review of information held within their authority and held at least one interdepartmental meeting to establish future roles in relation to Part IIA. One local authority officer stated:

"At the moment we have a good working relationship with all our planners and initially it may well be that the planning division take the lead on the strategy but then the emphasis is going to have to change and it is going to have to come more to environmental protection to get the ..... enforcement right. We are going to have to work quite closely together. Ideally what we would like to do is have a cross directorate working group. An ideal world has a team... but no doubt you are going to ask me some more questions about resourcing and are we doing anything about these bright ideas."

The responses to the other questions have been grouped into 'common themes' which identify both positive and negative aspects of the Part IIA regulatory process.

9.5.3 Resources

Resources were seen as a major potential barrier to the effective implementation of Part IIA. Only three local authorities stated that they had managed to obtain any funding for their Department or Service specifically for implementing Part IIA. The majority of local authorities that took part in the interview phase stated that they had been unable to obtain funding for their Service. A number of typical responses are given below:

"No telling, no telling at all. We fight our corner. That's as much as we can do. It does seem that contaminated land is not something that local authorities are pushing under the carpet, but on the scale of things, the way all the resources are being pushed around we get to find out just how important they think it is."

"Yes, we have got one major difficulty, we have not got the resources to do it."

"We have been working for the last two years at officer levels and trying to push up to get decision made on resourcing, we know what we think we need in an ideal world and we have been digging hard for that, we have not been successful so far in getting it."

"I think we are being optimistic, in between times we are trying not to be put in a position whereby we do it by default. Because we have enough on our plates as it is."

"Yes it will be myself who will be writing the strategy. It is a case of under resource, and it's like, "you're suited to that" and naturally it ends up on my desk and I just get on with it."

"Resources... you are always expected to work on the breadline in local authorities."

"The big concern that I have got is that this authority particularly does not have any legal backup in terms of contaminated land. I can see that if owners, people who are being held responsible, the first thing they are going to do is run to their lawyers and I just wonder where the resources are going to come from for local authorities to fund that part of it, never mind the technical side."

"We have been realistic to the resource issues which we are raising because we have been told that there is no finance bill for this year. We have had to budget from last year which is totally silly because we should be approaching it next year. There is no staff...so at this stage in time there is no tangible input."

9.5.4 Estimated Budget Costs

At the interview phase only half of the local authorities were able to provide an estimate of the budget that would be required to implement the strategy. The estimates tended to include the cost of one extra member of staff and potentially some investment in computer hardware and GIS software. The average budget figure based on the interview phase was approximately £45,000. A summary of some of the responses are given below:

"We looked at what was supposed to have gone into our planning investment, which according to our calculations throughout the council, because of it's size and population, was due about 1% of the total cost which worked out about 96k. So we put in a bid higher than that, because we didn't think we would get it, but

we haven't got anything so we actually worked out costs of about 96k for the second year, 110k for the first year, but obviously that was just putting a bid in and see what you can get and we haven't got anything."

"We have had both ends of the spectrum from companies offering to do the strategy for £2,000 ....a very simple vision of where we need to go in the future - out to other organisations - which are plenty - to put it all on GIS but your talking about £50,000."

"If you break down my time, as part of my time this year has been contaminated land, so probably £12,000 of my salary, £13,000 on the BGS' work computer hardware, software, probably another £1,000 you would be looking at a minimum of £30,000 and that would be very cheap."

"We have not worked out a cost."

"There is a figure of £50,000 which has been promised at high level. We haven't actually got this yet, but the Head of Service said "get on with recruiting and sort your hardware out". So we have been told to get on with it, and if we don't get the money, we will just take it from somewhere else...I don't know where though because it's not ringfenced."

"No we haven't, about three or four years ago we appointed one technical officer whose role would be part contaminated land, but at that time we did not know what that meant and it included contaminated land, air quality and everything else that goes for it. That resource, I will be honest with you, has been swallowed up over time anyway, so we haven't got any specific staff."

9.5.5 Strategy Production (progress)

The interview phase highlighted a number of different levels of progress in relation to Strategy production. Different approaches to developing the inspection strategy were evident. Ten of the local authorities in the East Midlands Region used the services of a consultant to create a template strategy that could later be tailored by individual local authorities to meet their particular circumstances. A few authorities had employed a new Contaminated Land Officer specifically to develop an identification Strategy. At the time of the interview phase, it appeared that the majority of local authorities would place the responsibility for creating an inspection strategy on an existing member of staff. Slow progress in relation to the development of individual inspection strategies are summarised in the following observations made by research participants:

"First of all there is a fairly woolly concept of what constitutes a strategy."

"I mean we didn't have a strategy, like some authorities...I've heard that some have already had a sort of strategy, sort of in place....we didn't. I think that some authorities are like that and others wait to see what is going to happen."

"I don't think that we will want to rush things. Basically there is the background of the current workload that we have got on, and the fact that we are already struggling to cope with some, especially like the emissions to air under the Environmental Protection Act. So it is difficult to foresee us really taking on extra duties which we will no doubt have to do without any new resources."

"We have been told that from the 6th March we have no resources set aside this coming year to fund the contaminated land programme. Before the end of the financial year we had a small amount [of money] spare. So we had to spend the money and actually bought a package from one of the consultants...which will help to develop a basic system. We don't have anybody to operate it though..."

9.5.6 Site Prioritisation Methods

At the interview phase only four local authorities had developed any formal site prioritisation methodology. Of these authorities two had bought in 'off-the-shelf' software packages with built in prioritisation software and the others were in the process of developing a method based on CLR 6. It was clear from the majority of the responses that there was still a large amount of uncertainty about how sites would be prioritised for future inspection even though this would need to form part of the information contained in the inspection strategy.

"I haven't even thought about it to be honest with you, I would imagine that we will try and rank it in some way."

"At the moment it is much too far down the line. I would hope that we would be able to come up with some system whereby we would be able to not just make it as simple high, medium and low, and actually have some risk based criteria on which we could assess sites – we could really do with some official guide from Central Government"

"We hope it is going to be very objective based on the D.O.E. profiles produced two years ago looking at contaminated land modeling. We will try and keep the front end of it simple but be able to justify it back to individual paper and sources in term of the ranking which is on going at the moment. We hope to put all this into the model, starting off on a very simplistic set of 10 questions and bring all that in. Using this map base we are looking at doing about 1 kilometre square a day on average and we have calculated that it should take us just over a year to 18 months to inspect all this."

"At the moment we are using CLR6 and not finding it totally satisfactory because it puts too many sites into Type A priority sites"

"We would like to do the job properly, and have actually got an under graduate student on placement working for my section. He is developing a privatisation methodology by a fairly simplistic method. Actually prioritising which sites we need to look out for first is what we are trying to do and then we anticipate that once we have got the strategy up and running we will do the inspection at that stage."

"We know by the end of June next year we have to have a strategy document in place. We have a slight hiccup in that we have GIS which has been ordered some time and we are in the process of correcting errors that have come back to us. As soon as we get the GIS installed and access to the information it's going to be very difficult for us to identify and prioritise the sites that we will be dealing with, but we do know that we have something like 3,500 potential contaminated sites."

9.5.7 Estimated Potential Number of Contaminated Land Sites

It was clear from the interview phase that all the local authorities interviewed felt that there would only be a small number of sites in their area that would require further investigation. The feelings of the majority of those interviewed are summarised below:

"No we haven't. I really don't know. Our single biggest high risk site has already been dealt with"

"I have to say to that "no". Initially probably about up to 12 what you could class as high risk sites"

"I think we are talking about a handful, in that the actual criteria of high risk sites."

"It may turn out that the sites that we think may be called contaminated land are not really a major problem, they could have already been dealt with."

"I think it is difficult to tell at the moment, my personal feeling is that the workload may escalate greatly."

"We have an idea of what we have, we don't expect to find any major polluted sites in real terms."

"We are really struggling to think of any that we are aware of because it has to be so bad in terms that it is going to explode or cause serious disease or death or injury that you would have thought that we would already have known about it. The one we are not so sure of is the pollution of controlled waters. Because obviously we don't know what is going on under a lot of these sites and it doesn't say significant pollution it just says pollution of controlled waters which is a lot stricter definition than significant harm."

9.5.8 *Defence of strategic policy*

One local authority Environmental Health Officer felt that they were unlikely to identify any site which has had a major impact on the way in which their strategy will be formulated:

"I will put it in context with us, as obviously we are environmental health, public health as a department and we had a duty to deal with land that had nuisance provisions. Now I can't recall in my dealings here that we have ever had to deal with that scenario historically so that will put into context perhaps how a contaminated land issue will affect us ultimately in terms of invasive site investigation. Nonetheless we are going through the strategy. We are approaching it strategically, but our priorities are reflected by what dealings we have had in the past if you like."

9.5.9 Timescales

The Statutory Guidance required local authorities to produce an inspection Strategy within 15 months of the Part IIA regime coming into force. The Statutory Guidance placed the onus on local authorities to decide the overall timescales for further inspection and subsequent investigation and regulatory action. Most local authorities found it very difficult to answer this question because they didn't know how many potentially contaminated sites would be identified as a consequence of implementing their strategy. There were a small number that were of the opinion that the overall timescale could be nearly twenty years. However, based on the overall response to the number of sites expected to be potential 'high risk' sites it could be argued that the actual timescale could be less than 10 years.

"Timescales, we have no fixed ideas on that. It's very difficult for us to set anything like timescales at the moment because we have not got the information available. The top priority sites we will use our initiative to give help, we will be looking at sites where controlled water might be polluted and looking at specialist sites in priority areas. Obviously within the strategy there is a link for us to expand to complaints as well, ... it is very difficult to say by a minimum of 20 years we will have inspected all these potential contaminated sites. It is very difficult to put a timescale on it and we could be looking at 25 years for completion."

"Unless the strategy, in the initial sweep throws up 101 sites that are all ranked fairly high I think the way that we would deal with it is just pick the priority ones off over a 10 year time scale. The other thing obviously which is going to be

thrown up are planning applications, once we have got the sites identified clearly planning is going to be one of the main drivers - which it is now to be honest."

"The main problem is putting something meaningful down in terms of timescale. Basically we have over 3,000 potential contaminated sites, which we are going to apply and value and process in order of the next few years."

9.5.10 Knowledge/Expertise

One of the factors identified by a number of interviewees was the lack or loss of staff with knowledge about individual potentially contaminated sites.

"We have had a few changes in staff, and we did have someone who was employed to complete the register to identify these sites. He was from a mining background and a very knowledgeable and capable person, but unfortunately he has moved on now."

"One of the problems you can get is the continuity, and if someone knows what he is talking about and then leaves it can be difficult to pick up afterwards...there are always going to be gaps in knowledge, because people always take their knowledge with them."

One interviewee identified that they would have to buy in the knowledge of consultancy services where they identified potential problem sites.

"We are not buying information. We may be buying in consultancy knowledge for the remediation and things like that or to determine what actually we do need. We have to, we have a limited budget of £5,000."

9.5.11 GIS

The interview phase identified that only one local authority did not feel that it would be necessary to store data on a GIS. The rest of the local authorities interviewed either already had access to a GIS or were considering purchasing one specifically for the purpose of storing information relating to land contamination. All the local authority Officers interviewed highlighted the potential benefits of using a GIS to store data.

Potential barriers for local authorities in terms of developing a contaminated land GIS related to the overall malaise in developing a corporate approach to

single GIS software package. It was apparent that there are a number of different 'off-the-shelf' software packages, many of which were often being used within one authority.

"We are aware that there is a vast amount of information that we can use. We have got access to two GIS systems, one GIS is with our planners which is MapInfo, the other GIS is GGP which is with our Property Services, so that's highlighted a problem. We clearly want a corporate GIS approach to this."

The benefits of 'buying-in' digitised datasets were also highlighted by more than half of the interviewees. However, the cost of purchasing this digitised data was seen as prohibitive and meant that initial searches may have to be undertaken using paper based mapping etc.

"We are not going to go and buy Landmark data for £28,000 without knowing how useful it will be. Our view is that we will do a provisional survey of what we have already got. We know where our receptors will be, where the engineering type uses and such like may be, and we will take it from there."

9.5.12 Public Access/Providing Information

In relation to public access to information nearly two-thirds of local authority Officers felt that they would not have a problem in providing information held on their GIS. Generally information would be provided at a cost and would be *caveated* to the effect that the purchaser was made aware that the information may not be complete and should not be wholly relied upon.

"We haven't thought about what we are going to do about public access at the minute because we haven't anything to put on the register. It isn't an issue we have thought about."

"We are receiving a lot of searches now asking for contaminated land, and if there are any landfills adjacent to sites, so we will answer to those to the best of our knowledge and try and be as honest as we can."

"I think in the initial stages it would be for the Council's own use. We do often get people approaching us and asking, "are you aware of whether this land is contaminated or whether there are any sites within X amount of metres of a contaminated site". At the present time it's difficult because we don't have that much information and the information we have got is really about landfill sites. I see us having any procedures in hand to make it freely available other than people coming to us and searching it or possibly in the future you could have anything couldn't you access via the internet – all sorts."

9.5.13 Relationship with the Environment Agency

One of the issues raised by the interview questionnaire was the working relationship between Local authorities and the Environment Agency in relation to dealing with contaminated land. The majority of interviewees knew their Environment Agency area representative. Most local authorities stated that they had not really had to deal with the Environment Agency in an official capacity. The main issue raised in relation to the role of the Environment Agency and local authorities was the issue of guidance and training:

"What I find particularly frustrating from talking to people at the Agency is their unwillingness to share 'their' information. There seems to be an awful lot of internal information which has been developed through R & D contracts – and that information is available to the Agency for free. If we want it we have to pay for it – even though in a round about way it has been paid for out of public funds. It seems to me that the Agency's role in all this keeps getting watered down and the amount of training they are providing is getting less and less."

We know that the environment agencies are having difficulties in recruiting and retaining staff, they have some serious financial problems, and we feel that perhaps the commitment is not there. We have the impression that there could be a lack of consistency of the information that is getting to us. We have to be fair and we think we have a long way to go, and we really must look to them for some guidance and support, one of their prime functions is to give specific advice to local authorities."

There are lots of things that are brand new for me, and I think we need more training. We are looking at the environment agency to provide the lead in those areas.

9.5.14 Lack of Guidance

The lack of specific guidance relating to the required contents of the strategy were identified by a number of the interviewees. Guidance relating to the prioritisation of sites was identified as an area that would be particularly helpful to local authorities.

"We have identified one or two problems. We find that the guidance is only very generalised in lots of areas, we are awaiting clarification in certain areas about what is expected, and this has given us some problems. We are reasonably well resourced and we are trying to push ahead with writing the strategy but it is hard to know what they expect in certain areas."

"What would have been good would have been if they had produced a specimen strategy, because we have no idea of the format of the document. We have had to make up our own and the terminology is a bit generalised and we do wonder what exactly they are looking for, so that is where the problem is arising."

"There is a need of some clarification on some issues, and of course it is very early days."

"We have got most of the information we need, the interpretation of that information and the means of prioritising the sites is difficult because of the guidance being held up."

"There are so many gaps. It's a bit frustrating really because we are champing at the bit. We want to get going with it, but we just do not have the information and tools to get on with the job."

9.5.15 Training

At the time if the interview phase, most local authority Officers identified that they had been on general training courses relating to the implementation of the Part IIA regime. From the majority of responses, it appears that most of the 'affordable' training had been organised by the Environment Agency. The cost of training was seen as prohibitive by a number of local authorities.

"At this moment we have been through some training which is very sketchy, more like awareness training, but these are very early days for us. But we are looking at this from a very strategic perspective, we are not looking at managing on site surveys, we are aware of our resources, our limitations and the expertise we have available."

"The difficulty you have is that (a) the time and (b) the money. We just don't have the resource to be sending people off on long weekly training so we have to fit in what we feel is the best for us, and at the moment because we have been waiting for the guidance we have really held back."

9.5.16 Potential Conflict of Interest

One local authority Officer felt that they were in a very awkward position as they didn't want to be seen as the person who was pointing a finger at his own authority and thereby costing large sums of money on remediation.

"We will be in the position of being the messenger which they [Councillors] might decide to shoot. It's happened before, it's the way of life in this job really.

It is a major issue for the local authority, a lot of local authority land will need to be investigated."

9.5.17 Specific Issues Relating to Regulatory Action

Most local authorities had not developed specific policies with respect to individual aspects of the Statutory Guidance. One local authority indicated that they would try and facilitate the development of land capable of being determined as contaminated land.

"We do know probably two sites that may need some action, they may by dealt with by the developer rather than the council serving any remediation notice. It will be the developer who wants to acquire the site for their use and would just oversee the remediation of the site."

Another local authority stated that they would try and assist owners (Class B persons) using the hardship provisions contained within the statutory guidance.

"There is also the terms of hardship remediation sites. We are quite keen to push this hardship provision through and to say to the owner, that if a particular parcel of land cannot be altered or remediated, some measures will be provided to take the burden off."

The potentially onerous task of establishing liability was identified by a number of local authorities:

"The first person to send a remediation notice, obviously I just hope it is not in our area, because it's going to tie-up, not just the legal people but the technical people for a long time, arguing through the liability and the whole of that side would just be a nightmare."

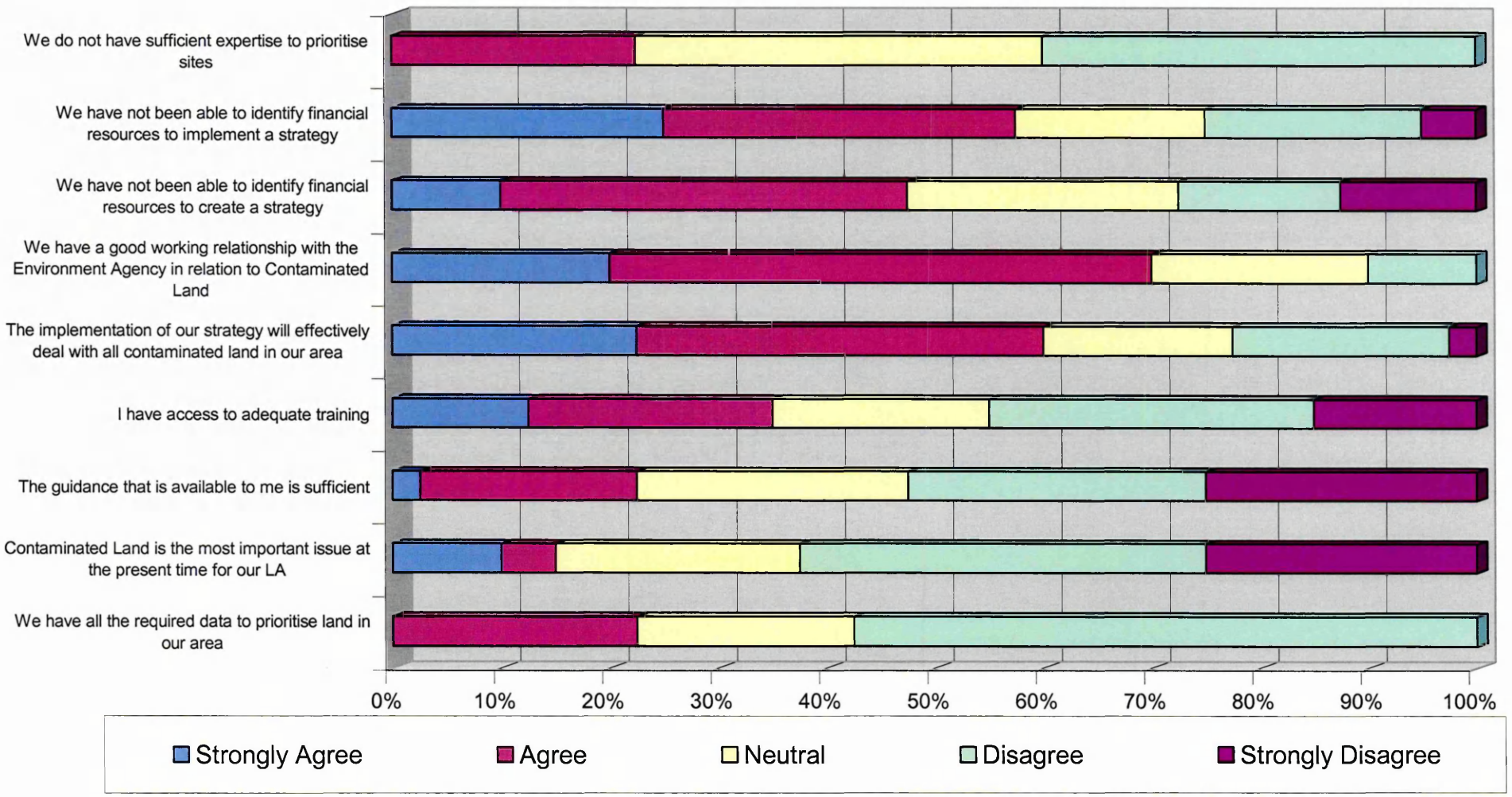
9.5.18 Interview - Quantitative Questions

The final part of the interview asked the interviewee to provide a score, given certain statements relating to various aspects of the implementation process. The interviewee was asked to state whether they strongly agree, agree, neutral, disagree or strongly disagree with nine statements. See chart on the next page showing local authority responses.

The responses to the statements revealed that most local authorities felt that they had sufficient expertise to deal with Part IIA. Nearly half the authorities felt

that they had not been able to obtain sufficient resources to produce a strategy. Approximately 75% stated that they had a good working relationship with the Environment Agency. Two-thirds of interviewees believed that the implementation of Part IIA would effectively deal with contaminated land in their area. Just over 40% of local authorities felt that they had access to adequate training. Only 21% felt that the guidance available to them was sufficient to enable them to implement Part IIA. Only 15% identified contaminated land as a high political priority for their local authority. 20% stated that they had all the data they required in order to implement Part IIA.

Chart Showing the Local Authority Responses to Statements Relating to the Implementation of Part IIA n=40



9.6 FOLLOW-UP QUESTIONNAIRE SURVEYS

Due to the time that had elapsed between the original focus group discussion and semi-structured interview phase a follow-up survey was undertaken to identify whether the barriers initially identified were still potential issues for local authorities. There have also been published survey results by others relating to the implementation of Part IIA which post date the interview phase, e.g. Parkinson, 1999 and Woodcock, 2001.

9.6.1 Focus Group Follow-up Questionnaire

A questionnaire was sent to each local authority that had participated in the original focus group. Due to the researcher's employment at Sheffield City Council it had been possible to maintain contact with this group and gain a significant amount of anecdotal evidence. It was therefore possible to identify the relevant person to receive the questionnaire. Four of the original participants had moved-on or retired since the original focus group. It was therefore necessary to provide a summary of the original findings to each discussion topic. For each discussion topic a number of supplementary questions were asked.

Discussion Topic 1

The Statutory Guidance has now been in place for 3½ years can you please provide details of:

- *Which department/ Service has what responsibility for contaminated land*
- *What information you have available to prioritise contaminated land, how this is stored and who has access to this information?*

Discussion Topic 2

- *What information is deemed sufficient to make contact with the site owner and/or undertake intrusive investigations?*
- *What risk assessment procedures are being looked at?*
- *How will potential targets be identified/prioritsised?*

Discussion Topic 3

- *What types of information and advice have you received from the Environment Agency?*
- *Has the information/advice helped you with the regulation of contaminated land?*
- *Have you acted in accordance with the advice given by the Environment Agency? If not why not?*

Discussion Topic 4

- *Have you had any conflicts between Part IIA and the planning process?*
- *Have any potential 'contaminated land' sites been dealt with through the planning process?*
- *What information are you requiring from consultants?*

Discussion Topic 5

Have any authorities looked at the cost of producing and implementing a strategy?

- *Who?*
- *How much?*
- *Who responsible for what?*
- *What timescales?*
- *What methodology have you used to determine whether a site presents a significant risk of being contaminated?*
- *How much land in your area would you estimate may be contaminated within the legal definition?*

The questionnaire was sent at the beginning of October with a request for responses by Mid-November 2003. Of the nine local authorities who were sent this questionnaire only four responded. The response rate was lower than anticipated due to staff changes within the local authorities that participated in the original focus group. In addition the questionnaire was designed to encourage a more qualitative response which requires more time for the participant. The interview phase questionnaire was therefore seen to be the quicker method of responding.

Whilst the above response rate was disappointing there was an overlapping factor in that the same authorities which took part in the focus group discussion were all involved in the interview phase. Therefore the 'missing' responses

could be taken into account within this phase. The group involved in the focus group stage tended to be more detailed in their responses to the interview phase questionnaire.

Due to the number of responses received, the findings of this phase can only provide an indication of local authority progress in relation to Part IIA. If sufficient time had been available it would have been preferable to have undertaken a second focus group discussion as this would have enabled a more direct comparison with the first discussion.

The qualitative comments received in each of the focus group questionnaires mirrored the responses received in the interview phase follow –up questionnaire.

Discussion Topic 1

Three of the respondents were based in Environmental Health and one was based in the Planning Department. All four local authorities stated that they were using a GIS package to store information relating to contaminated land. Two of the four local authorities had purchased the Groundview prioritisation software developed by 'Netcen'. One local authority was using CLARE, a database prioritisation package developed by CES and the other had not yet chosen any prioritisation package. There were issues relating to internal access to the information as all local authorities that responded held the contaminated land information on a 'stand-alone' computer.

Discussion Topic 2

All the local authorities stated that they would identify potentially contaminated sites using historic maps, environmental health files, trade directories etc, One of the respondents stated that they had purchased historical mapping data from Landmark, one was buying relevant digitised data in accordance with its strategic programme and the other two stated that they would be using paper mapping and putting relevant information onto the GIS (this is similar to the method suggested in Chapter 6).

In cases where pollutant linkages are identified the consensus of all the authorities was that SCA would have to be used to fund a proper scientifically based risk assessment. However, as one respondent stated:

> *"The main barrier that I can foresee is the securement of funding for the investigation stage of the strategy. I know SCA is a source but on a site by site basis this is only going to stall the process further"*

One local authority had spent a considerable period of time adjusting its prioritisation methodology. This was due to the large number of potentially contaminated sites that had initially been identified due to the proximity of potential receptors to sources of contamination. This has now been resolved but has created a considerable delay in implementing the strategy. This same local authority had also suffered delays due to other technical difficulties with information technology failures.

Discussion Topic 3

There was a positive response from all the local authorities in respect of their relationship with the Environment Agency. The majority of advice and information received related to land that has been developed through the planning process. Two of the local authorities had received a large amount of help in relation to three potential special sites. One has now been determined as a special site and the others are currently being reviewed by the Environment Agency.

It was noted by one respondent that the Environment Agency are not sufficiently funded by DEFRA and that insufficient resources are available to produce the required guidance and promote its effective use. The same respondent also noted that the lack of Soil Guideline Values (SGVs) was causing difficulty in assessing contaminated land reports where no SGVs are currently available.

> *"This fact has required more Officer time in reviewing information, subsequent discussions with consultants, the Environment Agency and other local authorities, before being sufficiently confident to accept certain risk assessment criteria".*

Discussion Topic 4

All the respondents stated that potential contaminated sites had been remediated through the planning process. These local authorities have produced 'developer guides' to make developers and consultants aware of the information that will be required in assessing risks associated with contamination. The respondents were all satisfied that, where the information in these guidance booklets had been followed, the land has been assessed and/or remediated to enable the land to be *suitable for use*. One of the issues mentioned by three of the respondents was the number of consultants who do not undertake a scientifically based approach to assessing risk from contaminated land and the "amount of time wasted trying to deliver the message".

One suggestion was that Central Government, through a representative body such as the Environment Agency or the Chartered Institute of Environmental Health, should require any person charged with undertaking a contaminated land risk assessment to meet a required level of competency. There is the Specialist in Land Condition (SiLC) qualification, funded by the Regional Development Agencies, which requires proven experience (8 years) and competency relating to contaminated land. However, this only provides the recognition that a person is competent to complete Land Condition Records rather than a comprehensive risk assessment. Consideration could be given by DEFRA or the Environment Agency making it a requirement of contaminated land risk assessors achieving this, or a similar accreditation before being able to submit a contaminated land investigation to a regulator, developer, landowner etc. Another consideration would be similar to the list of competent consultants used by Ohio EPA (See Chapter 7) that requires them to meet strict rules and pay a suitable fee to be accredited.

One local authority identified a potential stalling tactic by a developer:

> *"Contamination of groundwater and a controlled watercourse is occurring and a planning application has been submitted for development into a retail park. This application was put in well over a year ago and it seems to me to potentially be a tactic to stall potential designation".*

Discussion Topic 5

All of the respondents stated that they had experienced delays with their strategy. Reasons that were stated included: lack of resources, not enough staff or staff changes, underestimates of the number of potentially contaminated sites, technical difficulties with GIS software and lack of technical published guidance. Two of the local authorities felt that they would have less than 10 sites that actually had to be determined as contaminated land and the others were unable to provide an estimate.

9.6.2 The Interview Phase Follow-up Questionnaire

The interview phase follow-up questionnaire was sent with a brief summary of the original findings, by email, to 59 of the local authorities in Yorkshire and Humberside and the East Midlands Regions. It was anticipated that a number of the original participants of the research may have moved on. Individual groups of authorities have a 'working group' where they discuss contaminated land issues. Email contacts were gathered with permission through the co-ordinators of individual groups of authorities e.g. YAHPAC, The Leicestershire Group, The Lincolnshire Group etc. By using this method it was hoped that the questionnaire would be delivered to the most appropriate person within each local authority. 59 out of 61 email addresses were received, of which 3 were found to be incorrect.

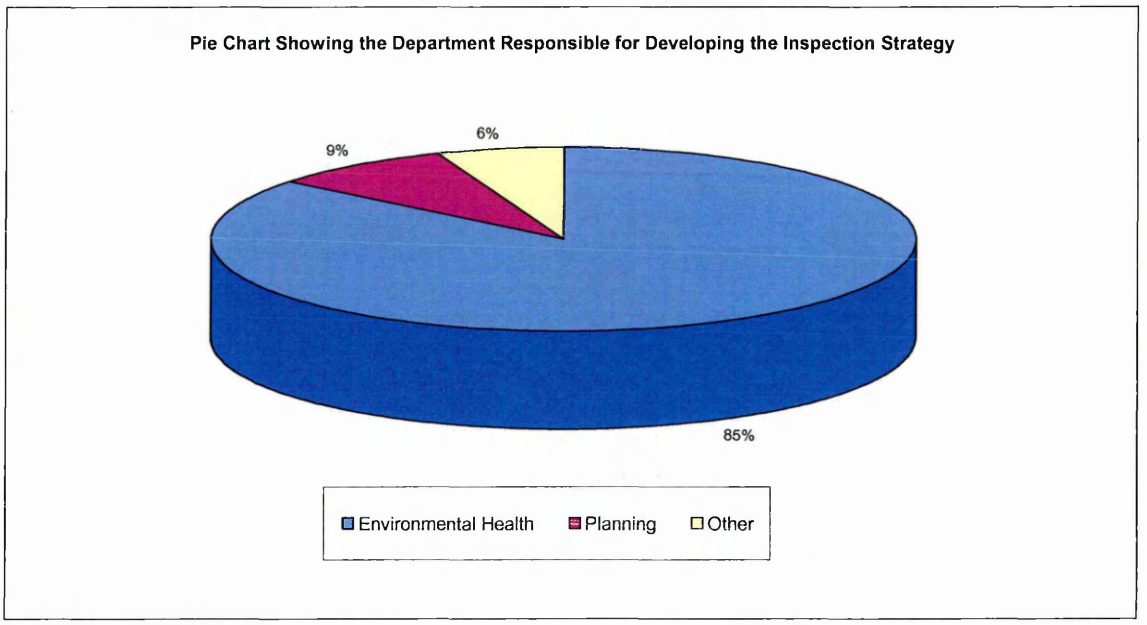
Responses were received from 35 local authorities, 5 of which were not involved in the original interview phase. This represents an overall response rate of 57%. It was decided not to remove the responses of the 5 authorities not involved in the original interview phase as their responses are indicative of the current state of local authority progress.

Due to the overlapping nature of the focus group follow-up and the semi-structured interview follow-up questionnaires the findings are discussed together below. Taking the overlapping factor into account, the findings from the follow-up survey represent the views of 64% of the local authorities in two regions being studied.

The Findings of the interview follow-up questionnaires are summarised below.

1. Which department was responsible for collating information relating to contaminated land and developing a strategy?

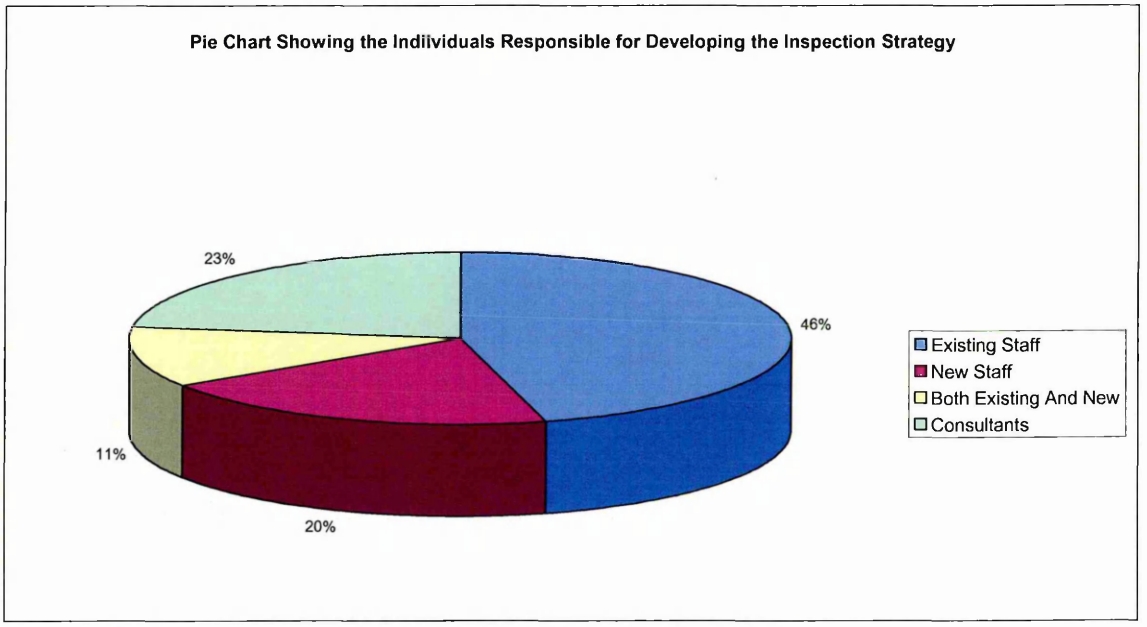
n=35



Responses to this question suggested that the findings of the original interview phase were unsurprisingly unchanged, in that the Environmental Health (or equivalent) Department was responsible for developing the Inspection Strategy. The result of 85% compared favourably with the response received by Parkinson (1999) who identified 81.5% of Environmental Health Departments would take the lead role.

2. *Was the strategy developed using existing staff, new staff, or external consultants?*

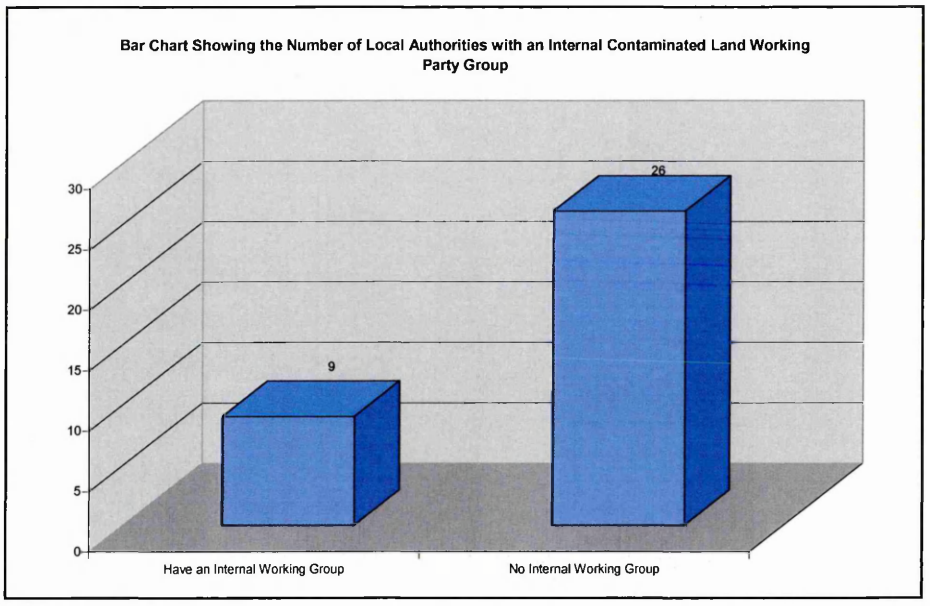
n=35



46% of the local authorities who responded stated that existing staff had been used to develop their strategies. 23% had used external consultants and 20% had employed new staff specifically to undertake the task. At the time of the interview survey, there was a considerable amount of uncertainty relating to budgets and the possibility that responsible departments would not receive any additional funding to fund the regime. The fact that nearly half of the responses identified an existing member of staff completed the strategy, suggests that there may have been difficulty in obtaining the required funding.

3. *Do you have an inter-departmental contaminated land working party group?*

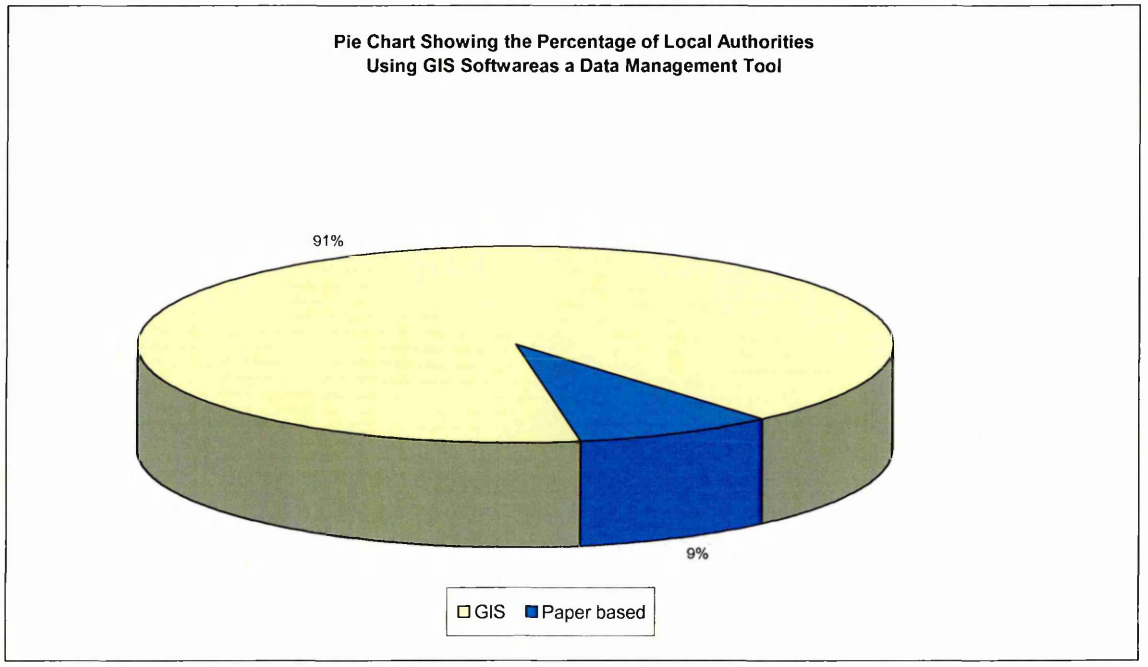
n=35



This question followed on from both the questionnaire survey and the semi-structured interview phase. At the time of these earlier surveys it appeared that there was an increase in communication between departments about contaminated land issues. Indeed, most local authorities indicated that they had held an inter-departmental working group meeting. From the responses received to this survey it was noted that many of these working party groups no longer meet to discuss contaminated land issues. It would appear from some of the discussions with members of the YAHPAC group that contaminated land is very much an Environmental Health 'problem'. An internal working party group is seen as being beneficial but a number of Officers stated they were *'stretched for time'* and noted a *"general lack of co-operation from other departments"*.

4. *How do you intend to hold information in relation to the status of land?*

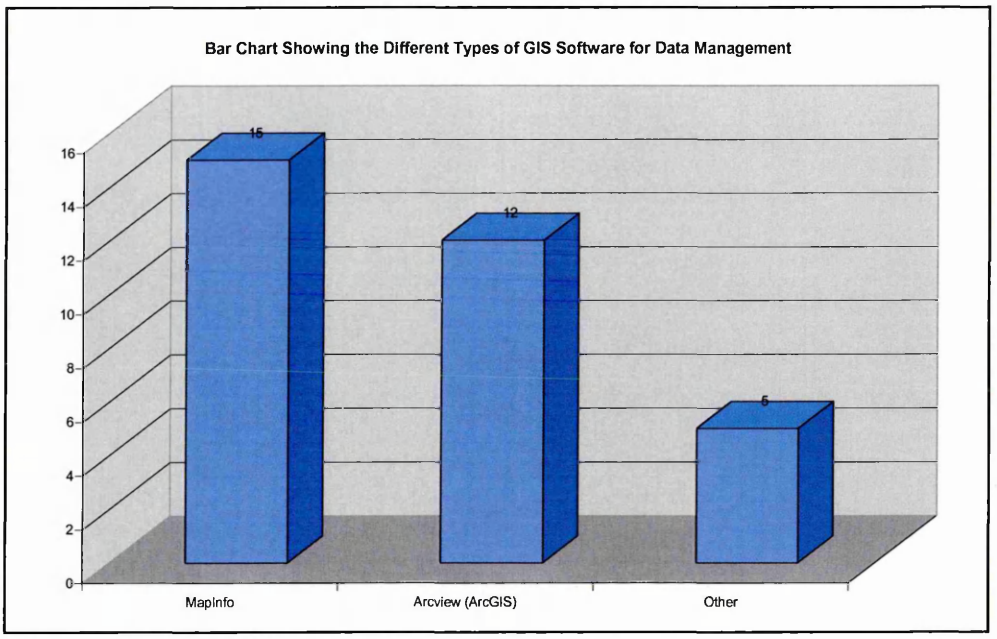
n=35



The majority of local authorities that responded to the survey stated that they were using GIS software to store information relating to contaminated land. This compares favourably with the results from Woodcock 2001 (90%). This suggests that most local authorities that took part in the original interview phase purchased GIS software specifically for the data management of information relating to Part IIA. This aspect is confirmed by a number of the responses to question nine, which indicated that there had been a considerable amount of expenditure on computer software and hardware in order to gather information and be able to prioritise sites.

4a. What GIS software system have you got/looked at?

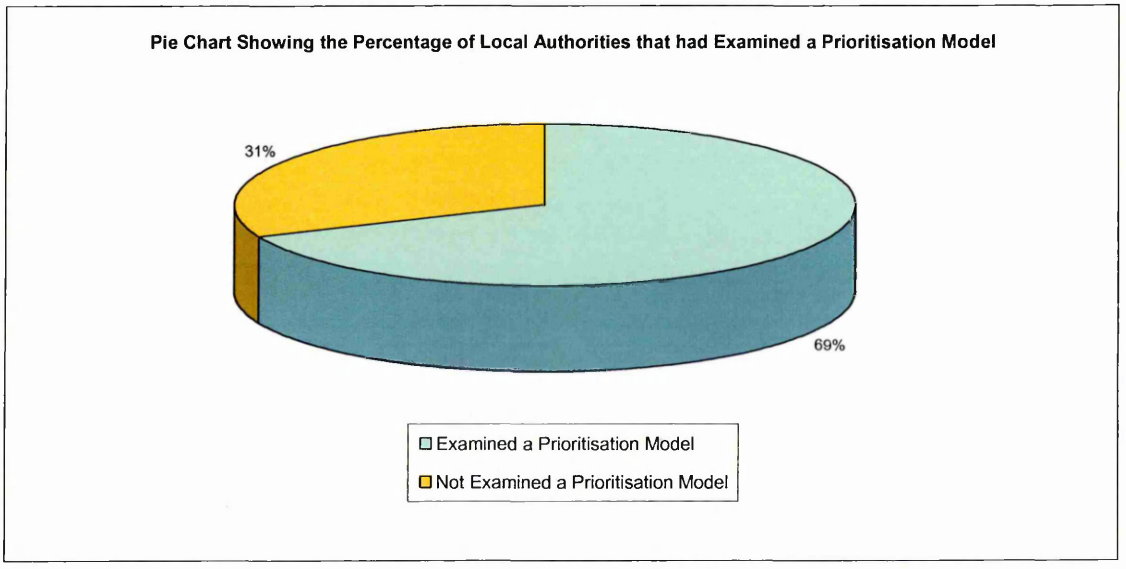
n=32



At the interview stage the decisions about which GIS to choose was seen as a potential problem. This was because many local authorities were looking at the possibility of a 'corporate GIS' system. The perceived problems related to the time it would take to get a 'corporate decision' about which GIS to choose. The responses to this question suggested that 84.3% had chosen either MapInfo or Arcview.

5. Have you examined any system for quantifying pathways and receptors in relation to prioritising land for further inspection?

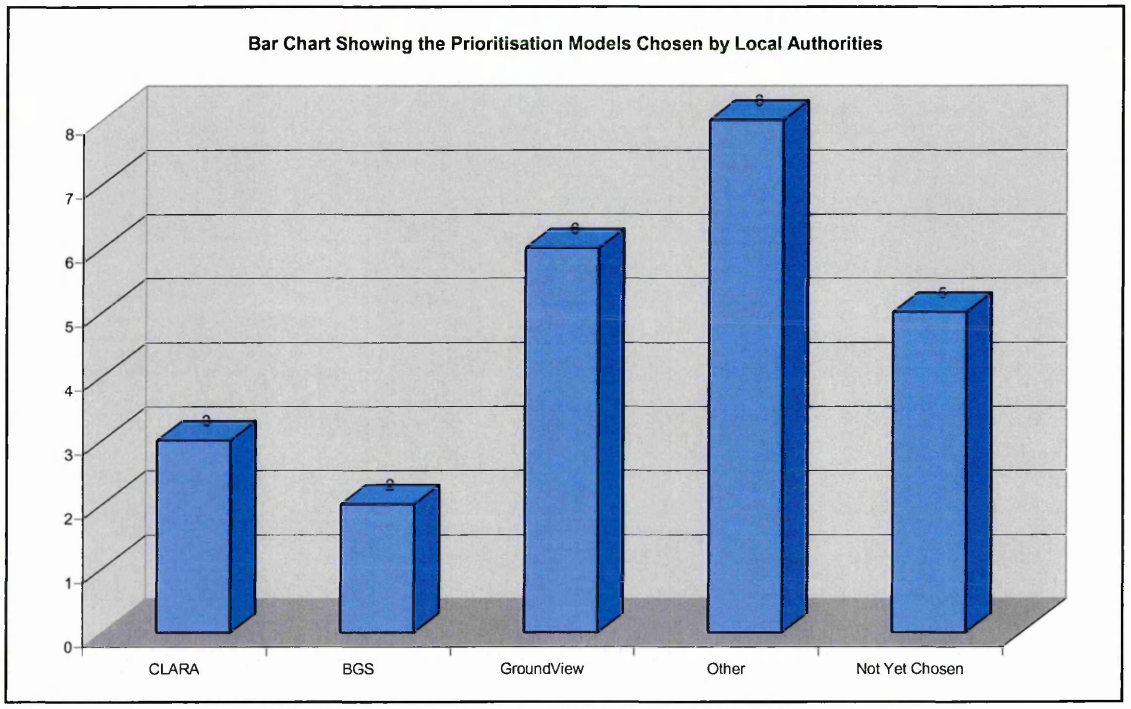
n=35



Over two-thirds of respondents stated that they had examined some sort of prioritisation system. It is interesting to note that nearly a third of respondents had not examined a prioritisation model. Further information would be required from this group to identify how they intend to prioritise sites for further inspection.

5a. Which system have you chosen?

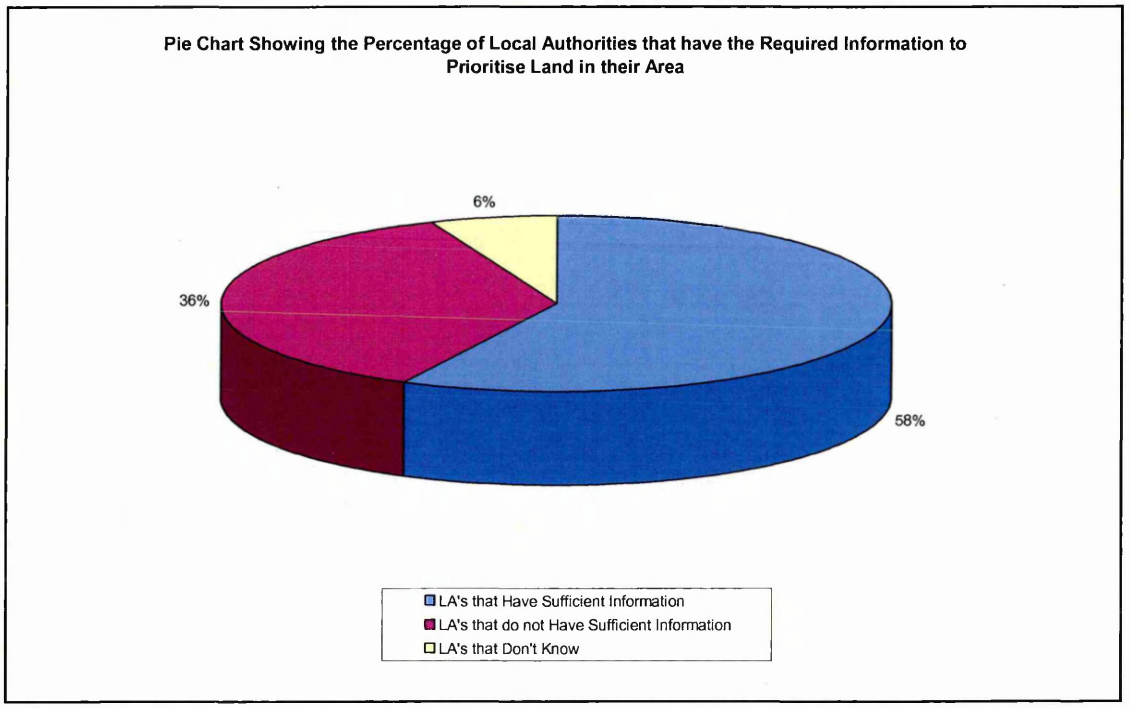
n=24



Of the respondents that had stated they had examined a prioritisation model, nearly half had chosen an 'off-the-shelf' package e.g. CLARA, Groundview and BGS. Interestingly, eight of the respondents stated that they had developed their own system in-house.

6. ***Will the information that is presently available to your local authority be sufficient to enable a decision to be made relating to a site's potential to be contaminated?***

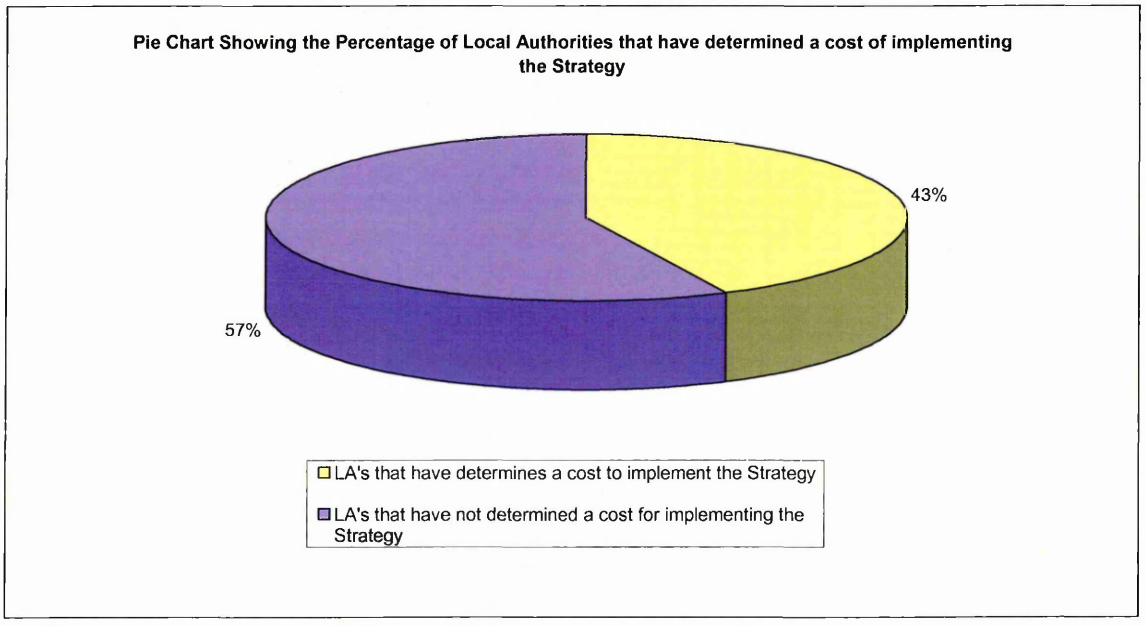
n=33



Nearly two-thirds of respondents stated that they had sufficient information to enable to decisions about a site's potential to be contaminated land. Those that stated they had not sufficient information, indicated that they would require more site-specific data obtained by sampling.

7. ***Has your authority determined a cost for implementing the strategy?***

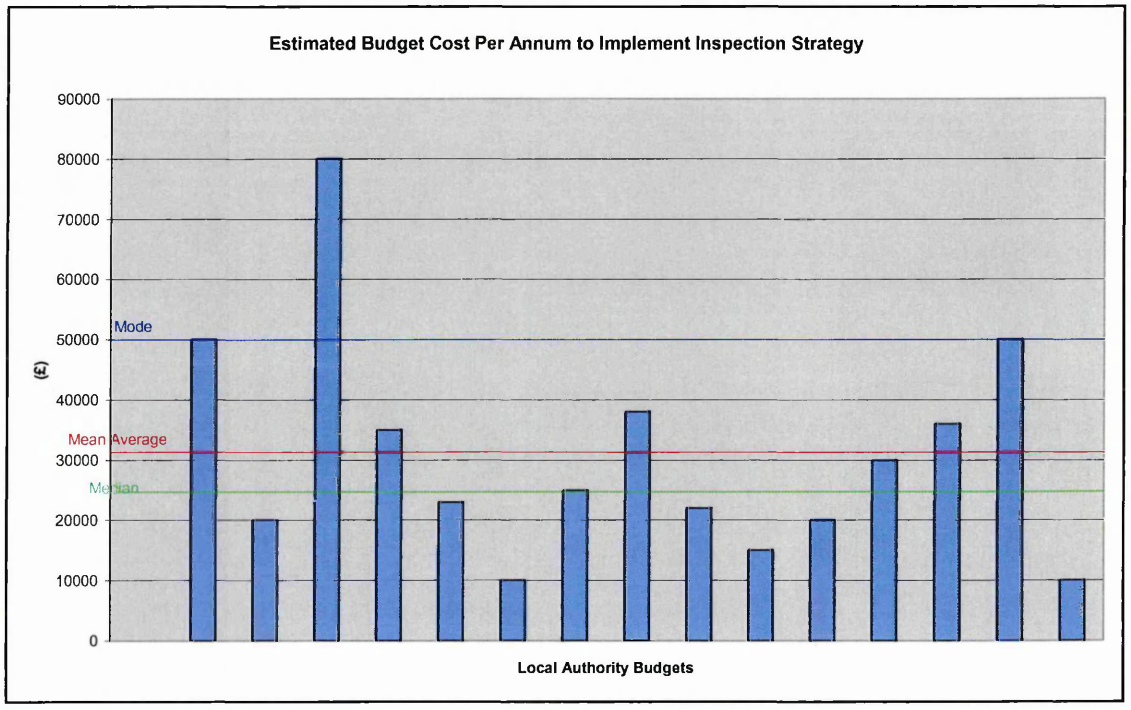
n=35



Only 43% of respondent's stated that they had determined a cost for implementing the strategy. This was a slightly surprising response. However, there may be a number of indirect costs placed in the responsible department's budgets that are not allocated specifically to 'contaminated land'.

7a. If so can you provide an approximate budget cost?

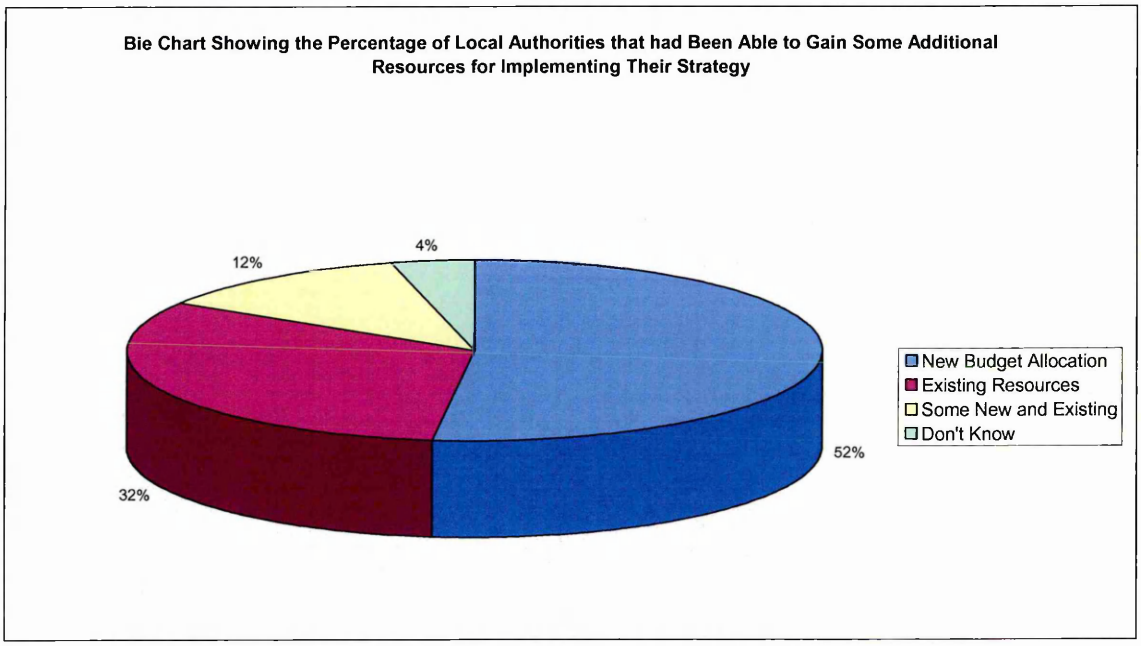
n=15



Analysis of the 15 respondents budget estimates for implementing their Part IIA strategy suggested that the mean average was approximately £31,000. However, by removing the one significant outlier (£80,000) the average cost falls to £27,500, which is approximately the cost of employing one full time Officer. The £12m budget allocated to local authorities equates to approximately £34,000 per authority. The amount of funding each local authority *actually* receives depends on a number of factors e.g. population, performance etc. Whilst this survey can only be indicative, due to the number of responses received, it appears that most local authorities have not been able to access money allocated for the implementation of Part IIA.

8. Has this cost been met by the finance department as a new allocation or have you had to trim existing budgets?

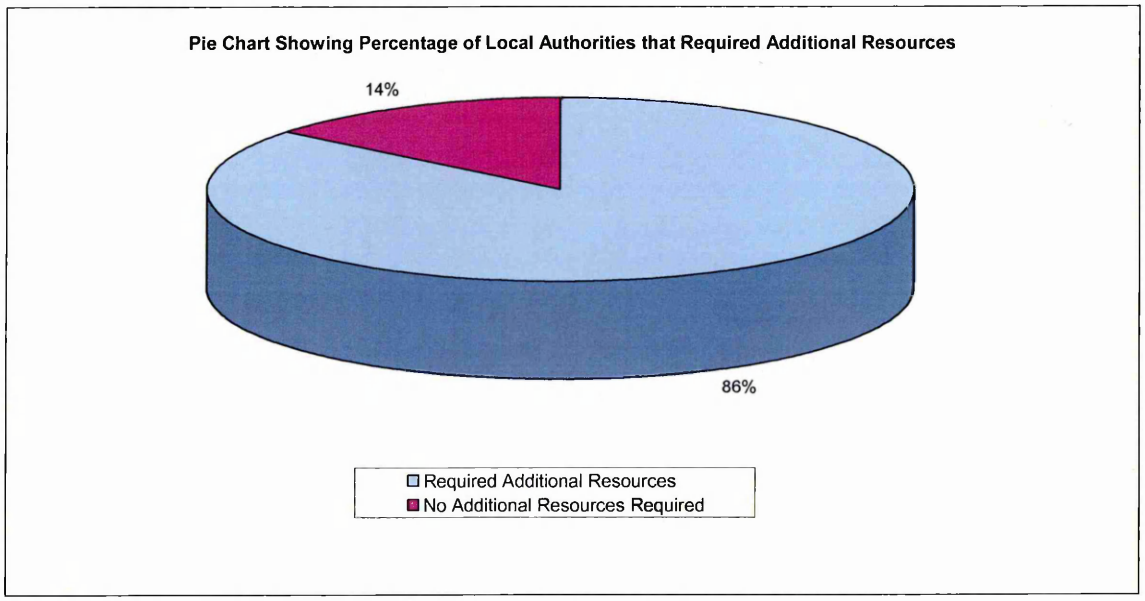
n=25



Analysis of the results from the 25 respondents that completed this question, 52% showed that had been able to obtain additional funding as a 'new allocation' with which to implement their strategy. 12% stated that they had been able to access some new resources but had had to rely on existing members of staff as well. Interestingly 32% stated that they had to rely on existing budgets.

9. Has the implementation of your strategy required any additional resources to be put in place?

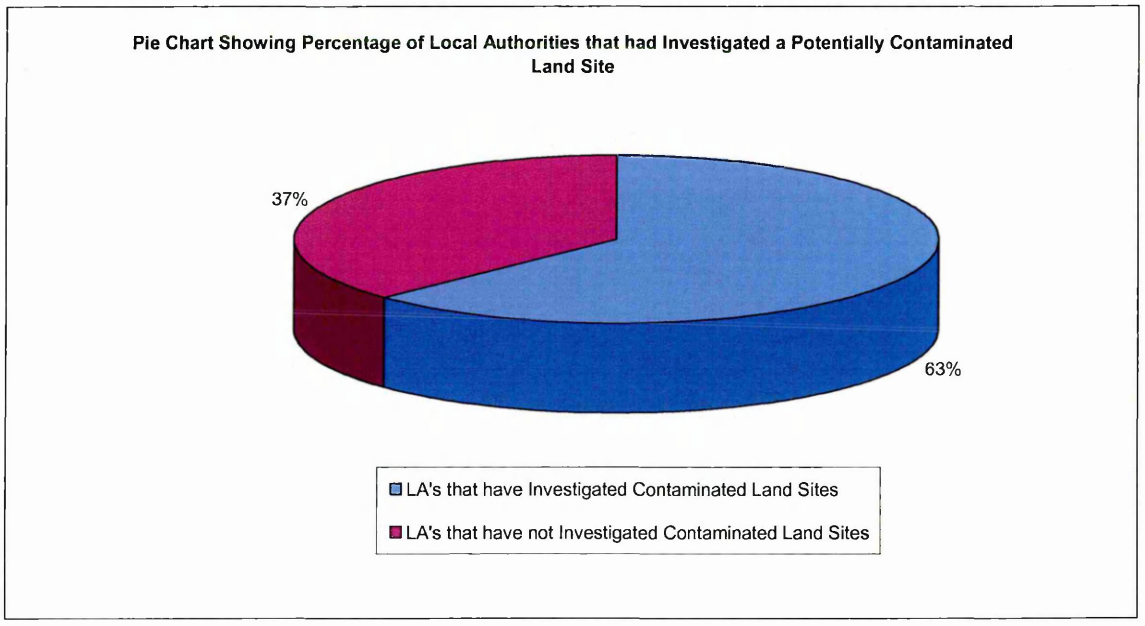
n=35



86% of the local authorities that responded to this question stated that additional resources need to be put in place to implement their strategy. Three of the local authorities which stated they had not required any additional resources had made a note stating that this was due to "the limited expectancy that they would find anything".

10. Have you investigated any potentially contaminated land sites ?

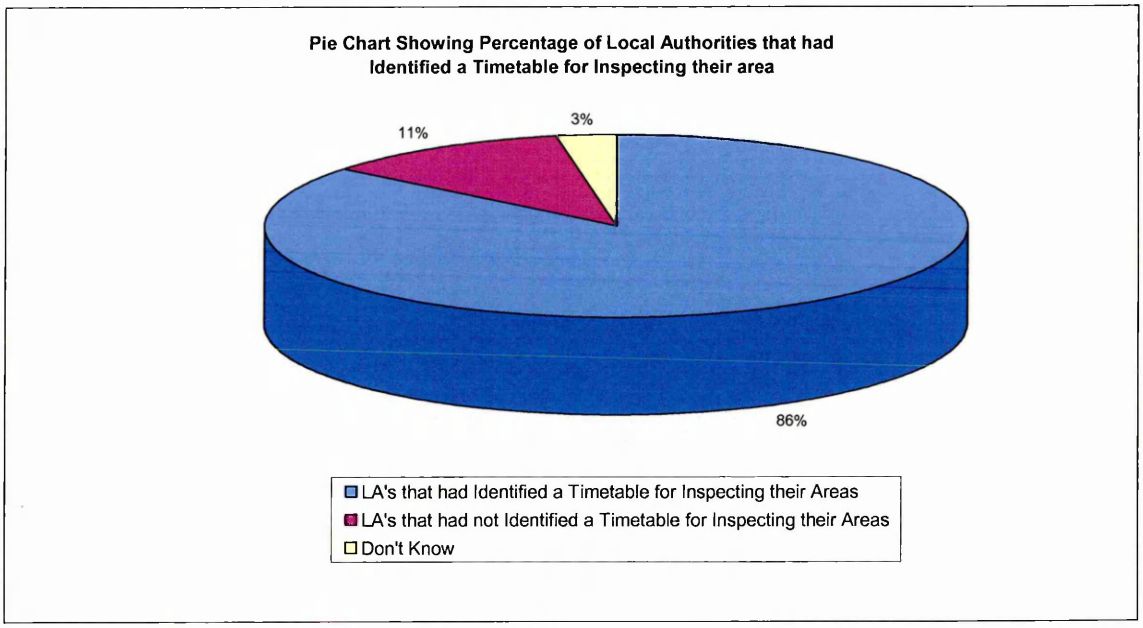
n=35



63% of respondents stated that they had undertaken some investigation of potentially contaminated land in their area. A potential weakness to this question was noted on receiving a number of the questionnaires. Different local authorities have different interpretations of the investigation stage. Some local authorities have all the information they require from the desktop phase to undertake intrusive investigations. Others however, only have polygon data on their GIS that suggests there may be a pollutant linkage, but will require further desktop investigation and reconnaissance.

11. Have you identified a likely timetable for inspecting and reviewing your area?

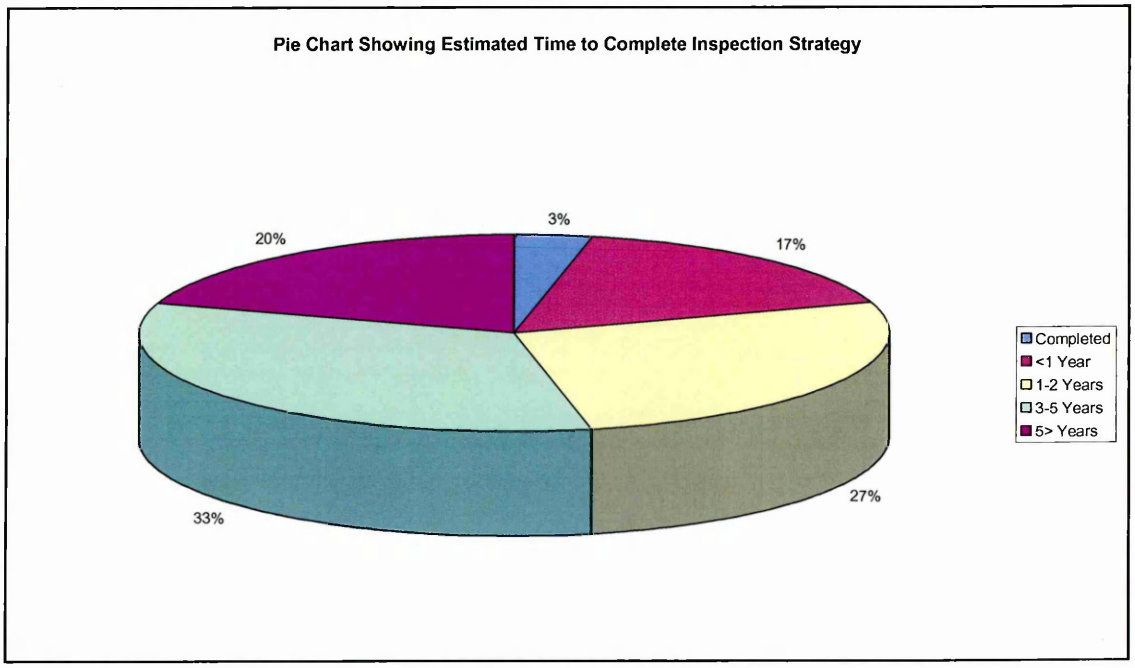
n=35



86% of local authorities had identified a timetable for inspecting and reviewing their area. The results of which are shown below in Question 11a.

11a If yes, what are the estimated timescales for prioritising land in your area?

n=30

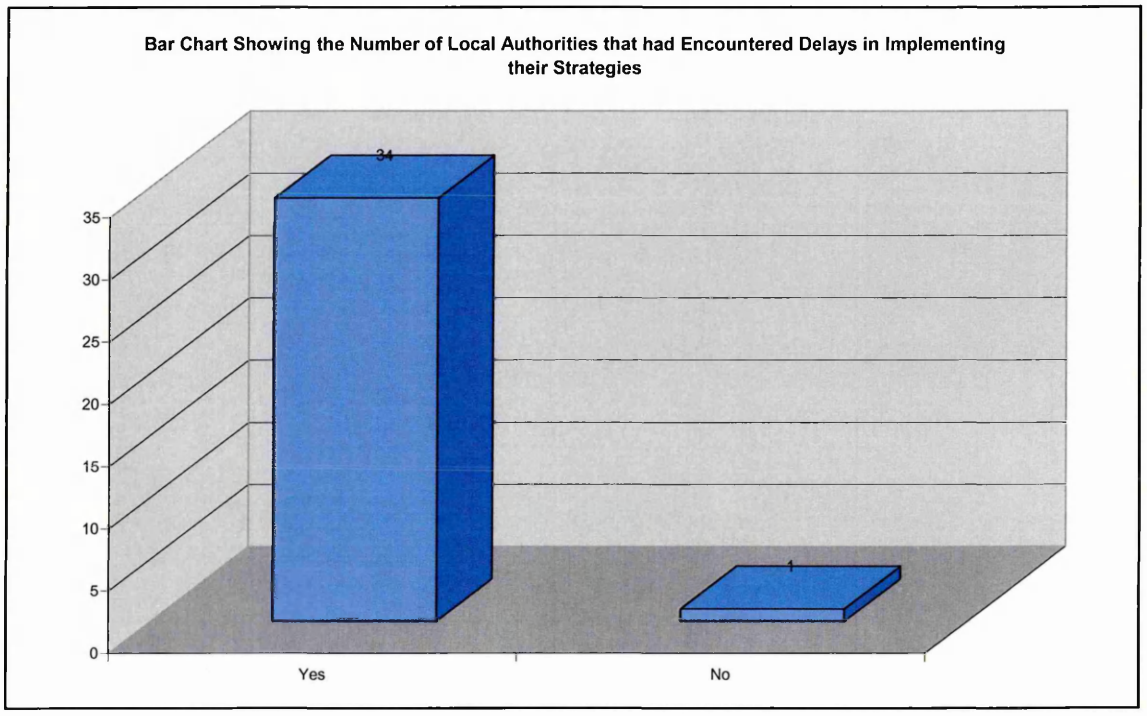


The results of this question suggested that more than half of the local authorities that responded to this question would take at least 3 years to

complete the prioritisation stage of their strategy. Indeed, 20% stated that it would take longer than 5 years.

12. *Have there been any delays in your overall progress with the implementation of your strategy?*

n=35



Only one local authority stated that they had not encountered any delays in relation to the implementation of their strategy. Interestingly, that local authority had undertaken a significant amount of work at the interview stage of this research and had already secure internal funding with which to implement the proposed legislation.

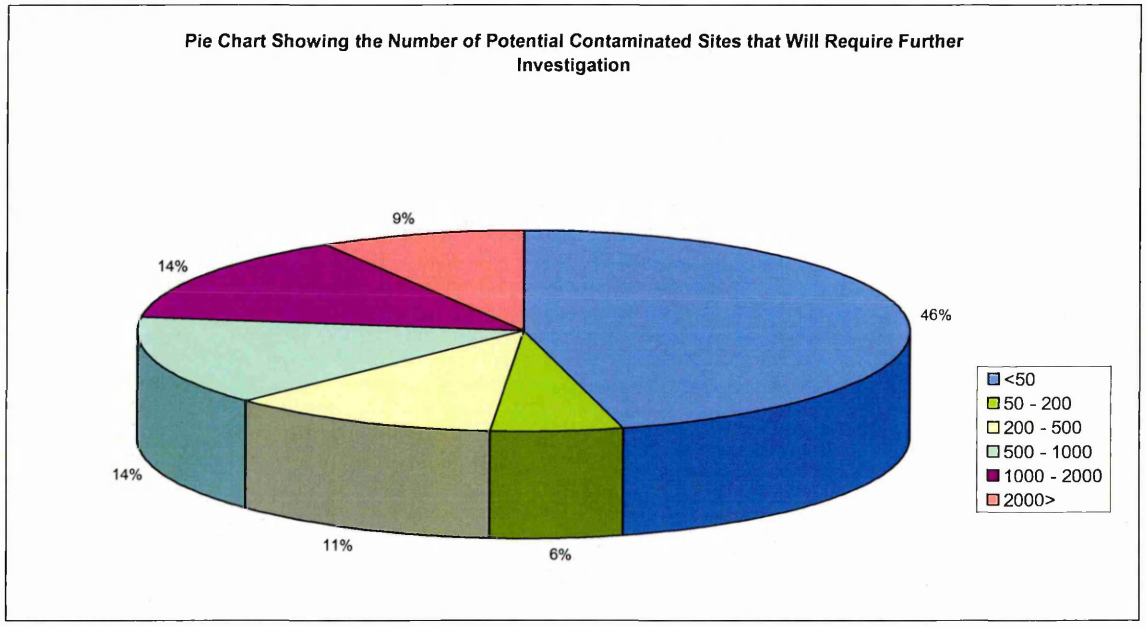
Reasons were provided for this delay by the majority of respondents. 74% stated that this had been caused by a lack of resources. Other responses included:

1. *Pressures of other work*
2. *Sites are coming through as part of planning process, which is taking resources away from Part IIA.*
3. *Failure to receive required GIS training*
4. *Lack of Staff*
5. *Amount of sites greatly underestimated*

For those Officers who are responsible for other work such as IPPC and nuisance issues there may be increased difficulties in relation to the effective implementation of Part IIA. This is because local authorities now have additional duties in regulating certain prescribed processes under the new IPPC regime, some of which need to be assessed in a significant amount of detail.

13. At this stage in your strategy how many sites have you identified that may require further investigation?

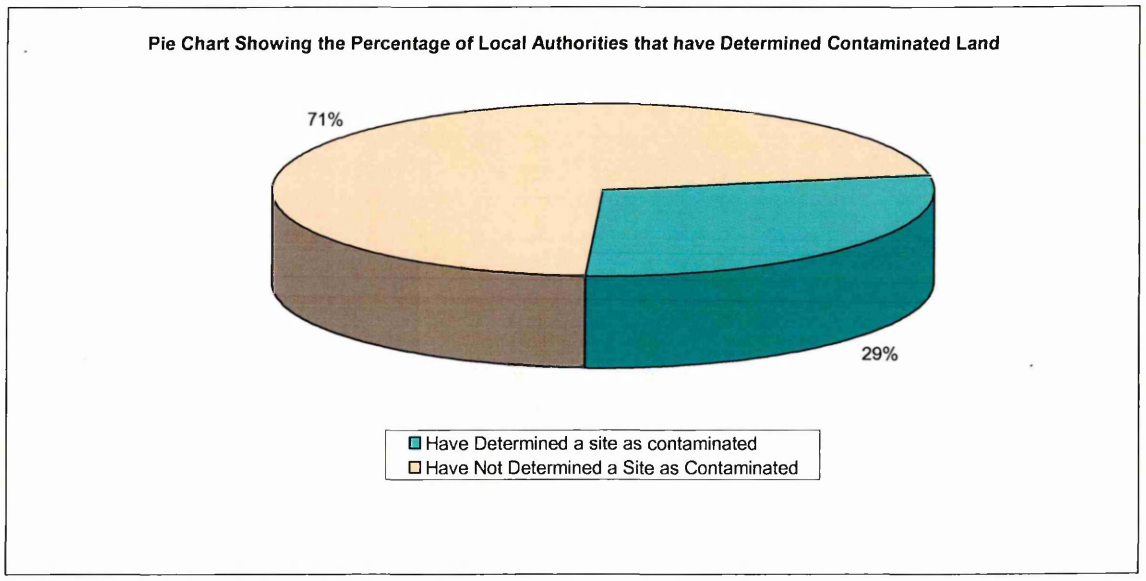
n=35



There was a significant variation in the numbers of sites that local authorities expected to investigate further. The reasons are attributed to the differences in the way local authorities viewed the term 'further investigation'. Of the 46% that stated less than 50 sites, it was clear that this meant further intrusive investigation. In all the other cases, it was not clear whether the further investigation related to additional desk-study work and reconnaissance or intrusive investigation. This question could have been phrased differently in order to distinguish between the two. Had it been possible to undertake another round of face-to face interviews, it would have been possible to correct any misunderstanding.

14. *Have you determined any sites as contaminated?*

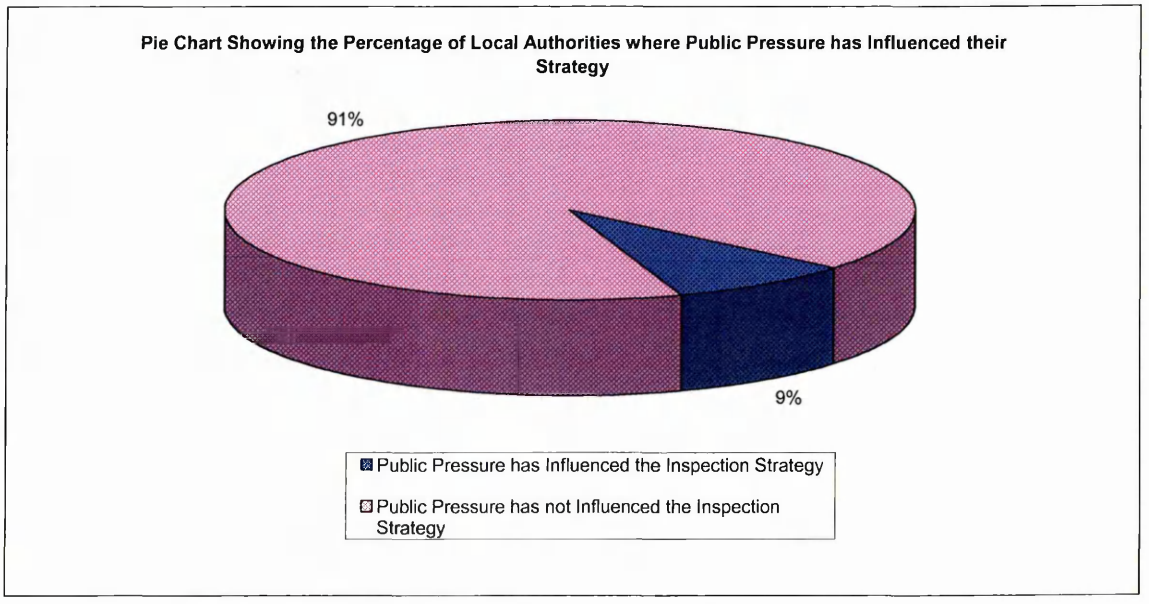
n=35



Interestingly 29% of respondents stated that their local authority had determined land as contaminated land. The total number of sites determined from this group of respondents was 14.

15. *Has public pressure had a bearing on your authority's inspection strategy?*

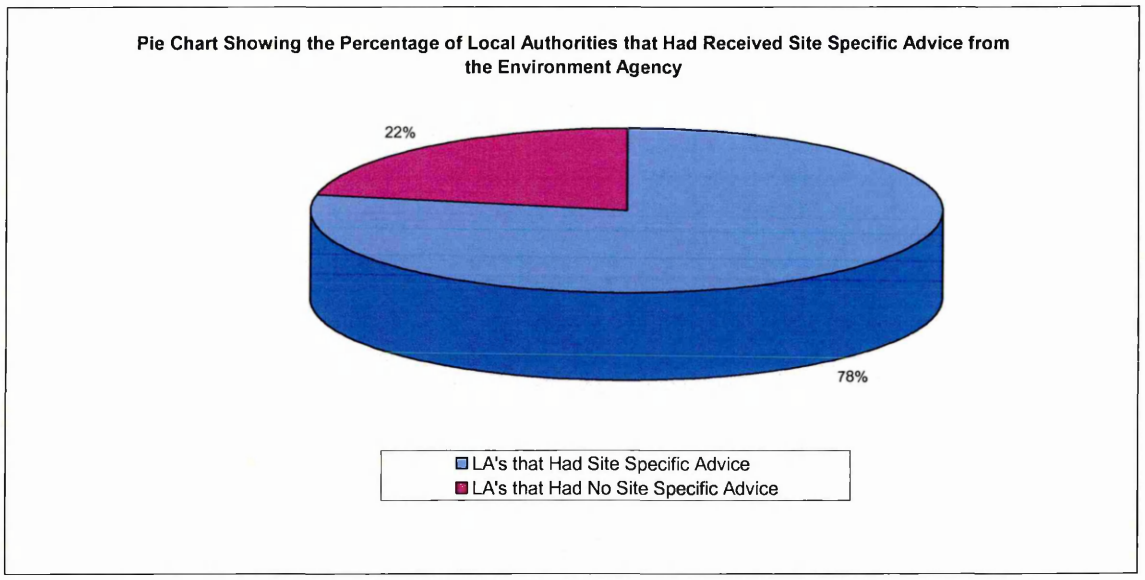
n=35



One of the issues that had been raised at the original focus group discussion by some of the interview participants was the potential that public pressure would have a bearing on Part IIA activity. The results of this survey suggest that public pressure has actually had little effect on the implementation of Part IIA.

17. Have you had any site-specific advice from the Environment Agency in your region?

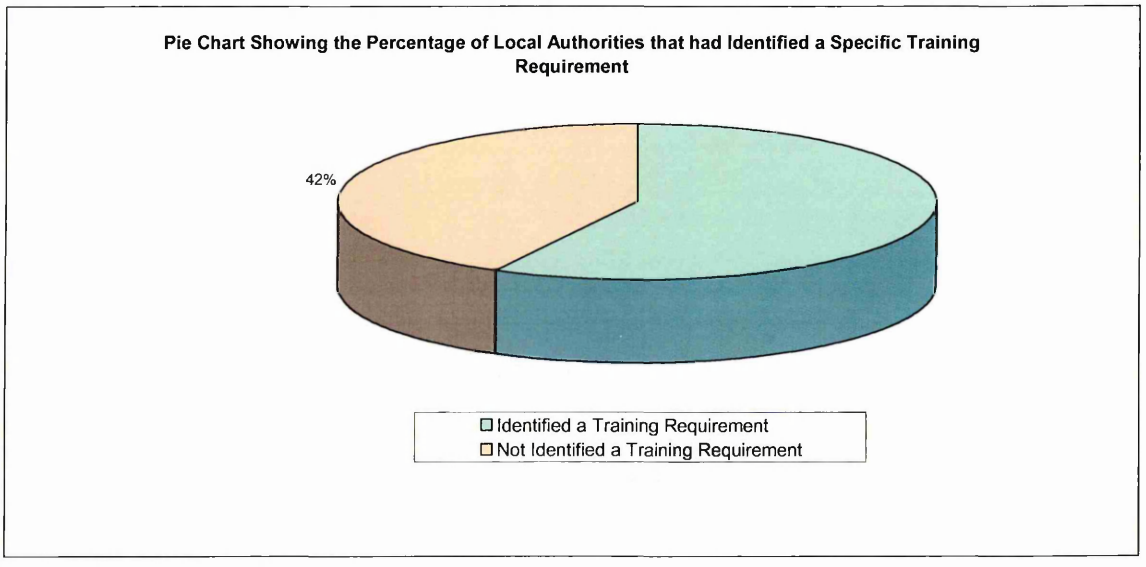
n=33



78% stated that they had received site-specific advice in relation from the environment Agency. Most stated that they had received advice relating to potential pollution of controlled waters in relation planning matters. However, approximately a quarter of respondents stated that they had received specific advice relating to a potential special site.

18 Have you identified any specific requirements for additional training guidance that would assist with the implementation of your strategy? If yes please describe.

n=26



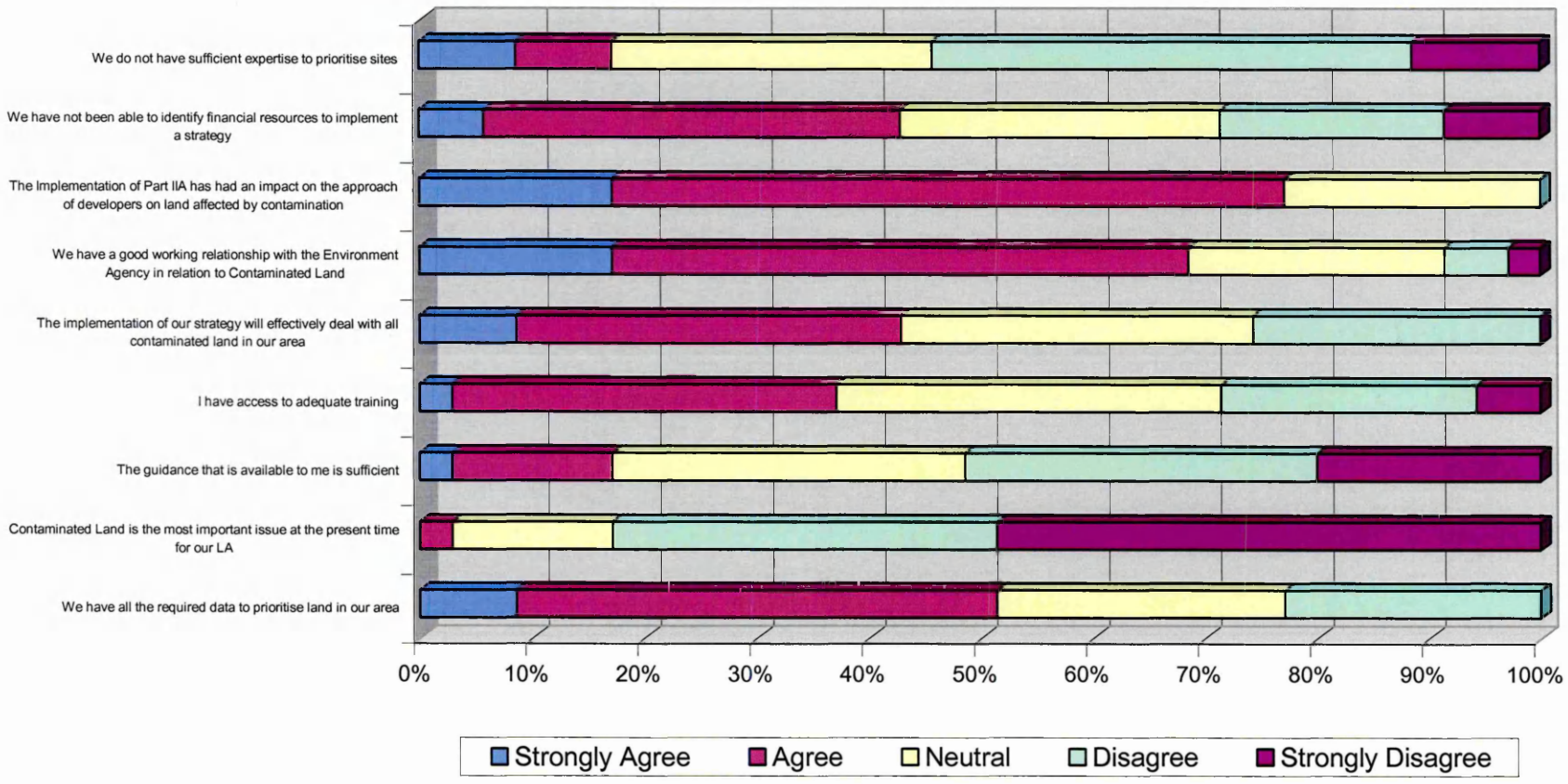
58% of the respondents identified a specific training requirement, the majority of which related to training on the CLEA package. The cost of training was noted to be prohibitive for a number of local authorities. Due to the resources difficulties faced by many local authorities, study leave to attend a University Course specifically on contaminated land (such as that run by LQM at Nottingham University) is not a practical option. One respondent suggested the possibility of a distance-learning course leading to an accredited qualification.

19. For the following set of statements in relation to strategy development could you please state if you strongly agree, agree, neutral, disagree or strongly disagree.

n=35

See the Chart on the next page.

Question 19 Follow up Chart Showing the Local Authority Responses to Statements Relating to the Implementation of Part IIA



With the exception of one statement, this question was the same as that undertaken at the interview stage of the research. The findings from the responses received suggested that 55% of local authorities felt they had sufficient expertise to prioritise land in their area. This represents an increase of 13% since the interview phase. During the interview phase 55% of respondents agreed they had not been able to identify resources to implement their strategy. In the follow-up survey only 42% of respondents agreed with the same statement. A different statement was added to the questions in this survey as the original question was no longer seen to be applicable. It was clear from the responses received that the majority of local authorities felt that the introduction of Part IIA had made a beneficial impact on the approach taken by developers. The local authority working relationship with the Environment Agency was still seen as positive, with 68% of respondents agreeing that they had a good working relationship. The results of this survey suggested that only 42% of local authorities felt that Part IIA would effectively deal with contaminated land in their area. This compares with 58% during the interview phase.

9.6.3 Qualitative Information from the Follow-up Phase

Question 20 of the interview follow-up questionnaire asked respondents to provide any other information that related to the overall effectiveness and progress of their contaminated land inspection strategy. These responses are summarised below:

Resources

- *"No resources for historic data"*
- *"Insufficient resources in relation to the number of sites"*
- *"Lack of resources – neither of the officers responsible for implementing the strategy are assigned solely to the task"*
- *"Most people within the LA are in denial regarding this statutory duty, we do not currently have the resources and do not look likely to get any to allow successful implementation."*

Funding

- *"Central government funding should be ringfenced for contaminated land"*

Strategy Progress

- *"Basically, I think the scale of the work involved was never quite appreciated when most people were writing strategies. There is so much work involved in setting up the GIS info, and this is from an authority that bought a lot of this data externally."*

Political

- *"Delays caused by greater corporate priorities"*
- *"Generally, there is a lack of political awareness and prioritisation of contaminated land. There are a number of cases that make it to the contaminated land press that have huge implications locally but these are not given wider publicity. The OPDMs push for brownfield development appears to be largely forgotten. This is seen as an environmental health issue, there is no visible national direction or integration with planning, economic development etc."*
- *"This is a semi rural authority, and it is likely that members see this as a "city problem", not something they need to worry about. There are no incentives to progress this through best values, CPA etc, so it is something that can largely be ignored at present. Conversely, they might be aware of the potential scale of the problems when issues are found and they are not pushing to progress CL because of their implications."*
- *"Perception of elected members that the service is not cost effective."*
- *"Contaminated land is not a widely recognised issue...and because of this there is little political pressure to take the strategy forward."*

Other Duties

- *"Staff are taken off contaminated land duties to deal with general pollution and noise duties. We feel that this is due to the lack of performance indicators for contaminated land."*
- *"I have also found out that I have now become the contact for the Council when it comes to GIS, and this takes more time away."*
- *"The vast majority of sites within our area are likely to be remediated as part of the redevelopment process."*
- *"This all has to be done between dealing with a huge rise in planning applications. Basically I don't have much time to do Part IIA, as most of my time is taken up through development work."*
- *"Lack of awareness of the impact of the legislation by other departments"*
- *"There is a lack of understanding of the legal issues by the legal department."*

Guidance

- *"There is an overall lack of guidance from DEFRA, for example the SGVs. This is hindering LAs in their implementation of Part IIA and making the planning process more complicated, by providing no clear guidelines for developers."*
- *"Lack of progress in releasing SGV and tox data"*

Searches/requests for Information

- *"I find the Envirosearch type surveys undertaken for conveyancing solicitors to be a bind. There are many occasions whereby the information given is OTT or unnecessarily disturbing to the reciprocants and also causing them more expense and ourselves time."*
- *"The number of requests for information we are receiving from solicitors relating to homechecks"*

9.7 SUMMARY OF FINDINGS

This Chapter has provided the results of a focus group discussion, a questionnaire survey, a review of consultation responses, a semi-structured interview survey and a follow up questionnaire survey.

9.7.1 The Focus Group

The focus group discussion identified a number of key areas relating to the proposed implementation of Part IIA where local authority officers identified areas of concern and/or uncertainty. This are as follows:

- A lack of internal co-operation in looking at contaminated land issues and the need to set up a working committee to determine roles in relation to Part IIA
- There was concern about ownership of the information due to the internal market system. It was felt that in some cases a department may be unwilling to share information with another department within the same authority because they bought/owned the information.
- Concern about who should have access to information held on a GIS, both internally and the general public.
- Concern about the accuracy of information stored on the GIS and potential liability for incorrect information relied on by third parties.
- The lack of technical guidance was very much of concern.
- The group felt it unlikely that the owner/polluter of the site would agree to undertake any site investigation. This will place the onus back on the local

authority to decide what is required in terms of the site investigation and incur the cost.

- The practical difficulties of implementing the apportionment and exclusion rules contained with the Statutory Guidance were also discussed.
- The focus group indicated that on the whole there had been very little work done in preparation for the implementation of S.57. Reasons for this were blamed on lack of time and also a lack of political will from heads of departments.
- Of the local authorities represented at the focus group, none had identified likely cost implications.
- There was a general consensus amongst the group that there are not likely to be many sites identified as contaminated land.
- Some local authorities felt that they may be put under unnecessary political pressure to investigate sites as a result of pressure groups.

9.7.2 The Questionnaire Survey

The results of the questionnaire survey that individual local authorities had begun the process of deciding which departments would be responsible for implementing Part IIA. Indeed, three-quarters of the local authorities indicated that they had undertaken some preparatory work. Local authorities had started looking at the information that they hold and ways in which this could be stored in the future. The vast majority of the respondents indicated that their preference was to store the information they gathered on a GIS.

9.7.3 Review of Consultation Responses

The review of responses to the Statutory Guidance consultation identified a number of key areas where local authorities may face difficulties in implementing Part IIA. The responses reviewed highlighted many of the same issues that were discussed in the focus group. The responses highlighted the need for the legislation to be properly resourced and the difficulties likely to be encountered when determining liability for remediation costs. Other observations related to:

- the potential physcological impacts on residents where contaminated land is identified
- the suggestion that technical guidance should be produced prior to implementation
- the possibility of making local authorities accountable in terms of their timescales for inspection

9.7.4 The Semi – Structured Interviews

The interview phase identified that, compared with the focus group and questionnaire responses, there had been some progress in preparations for the implementation of Part IIA. The responses to a number of the questions raised in the interview phase indicate a number of continuing potential barriers to the effective implementation of Part IIA. These can be summarised as lack of existing resources and inability to access the additional resources provided by Central Government in individual local authority Standard Spending Assessments. Where budgets had been identified or estimated, this was seen as the cost of a full- time Officer and new computer hardware and software. The average overall budget estimate was in the region of £45,000.

The majority of interviewees felt that there would not be many sites within their area that would be capable of being classified as contaminated land and that their strategic approach would take that fact into account.

Internal barriers relating to corporate GIS packages were slowing development of the contaminated land strategy. The lack of specific guidance about the required contents of the strategy document, and more detailed technical guidance about undertaking site investigations was seen to be holding back a number of local authorities. The cost and provision of training was an issue for a number of local authorities and it was felt that the Environment Agency should play a much more active role.

The above qualitative statements suggest that the respondents are struggling to implement their contaminated land inspection strategy as intended. A lack of political awareness and/or willingness to implement the contaminated land strategy has led to a knock-on effect so that additional resources become difficult to justify when compared against other statutory duties. Individual Officer time appears to be lost from Part IIA to other duties, such as assessing contaminated land reports for the Planning Department, undertaking land searches or maintaining a GIS. The slow delivery of soil guideline values also appears to be having an impact on local authority progress.

9.7.5 The Follow-up questionnaires

The follow-up survey identified that many local authorities did obtain some funding to implement their strategy. It is apparent that this funding has not been adequate as all those local authorities which responded to the follow-up survey stated that they had not met their original timetable. This appears to be due to limited resources, the potential number of sites to be investigated, lack of technical data/training and low political importance attached to contaminated land. The requirement for local authority officers responsible for implementing Part IIA, to undertake other duties relating to planning consultations, air quality monitoring etc. is also having an impact on implementation.

Chapter ten provides further evaluation and appraisal of the research findings presented in chapter six, seven, eight and nine.

CHAPTER 10
EVALUATION OF FINDINGS - PROBLEMS AND SOLUTIONS

10.1 INTRODUCTION

This thesis is concerned with the regulation of contaminated land and the way in which local authorities in England have prepared for and are now implementing Part IIA of the Environmental Protection Act 1990. This research has reviewed literature relating to UK policy on contaminated land and the application of a risk assessment methodology for the identification of contaminated land. The research undertaken provides an assessment of local authority preparations and subsequent regulatory action in relation to the implementation of Part IIA. A review of findings over this period of time identified a number of potential difficulties for local authorities which were not addressed by policy makers prior to the implementation of Part IIA. The latest findings of this research identify a number of key areas where local authorities are now struggling to implement Part IIA effectively.

This chapter provides a critical evaluation of the research findings in relation to the key questions identified from the literature review. This evaluation identifies eleven key areas where local authorities are experiencing problems in relation to the effective implementation of Part IIA. Based on evidence identified in the thesis and on the author's own experience potential solutions are suggested in relation to each of the identified problems.

10.2 THE UK POLICY APPROACH

This section discusses the findings of the research in relation to the UK policy approach towards contaminated land described in the literature review.

10.2.1 The Amount of Contaminated Land

The lack of any reliable estimates on the amount of contaminated land in the UK was highlighted as a significant problem by the House of Commons Environment Select Committee in 1900. The introduction of Part IIA was intended to provide more accurate data regarding the amount of contaminated land in England.

It was noted in Chapter Two that a number of different estimates had been put forward, which suggested that due to the narrow definition there would only be a small amount of land capable of being determined as contaminated land. Nathanail suggested, that based on the experience of other European countries, there may be between 5,000 and 25,000 sites (Nathanail, 1999:1). The area has been estimated by others at anywhere in the region of 2,800 hectares to 20,000 hectares (Syms, 1997: 289, Denner, 1999 and EA, 2002:2). It was questioned as part of this research whether a pro-active scheme of identification was required with such a small estimate of land likely to be contaminated land. In the United States it is not a requirement to pro-actively identify hazardous sites which have the potential to cause significant harm to human health. Instead, problem sites are dealt with reactively by the Environmental Protection Agency.

Early research undertaken as part of this thesis identified that there are not likely to be many sites identified as *contaminated land*. At the focus group discussion most authorities felt that they were unlikely to identify any land capable of causing *significant harm.* This view was supported further at the questionnaire phase of the research where a quarter of local authorities indicated that they expected to identify less than 5 contaminated land sites.

> *"So far as Part IIA is concerned the definition of contaminated land is relatively narrow. As a consequence of this I do not anticipate that this will pose any major problems"* (Local authority response, Questionnaire survey July 1999)

Currently reported figures from the Environment Agency (Environment Agency, July 2003) state that 58 sites have been determined as Contaminated Land in England. Of these, 15 are Special Sites. In addition, the Environment Agency

has agreed to inspect a further 15 potential special sites (Environment Agency, 2003b). The Environment Agency report *Dealing with Contaminated Land in England* (Environment Agency, 2002) suggested that:

> *The number of sites determined is low because local authorities have concentrated on preparing a strategy for inspecting their land and have not yet finished inspecting their areas. This number is expected to increase as the inspection progresses.* (EA, Sept 2002:1).

However, findings identified as a consequence of this research would suggest that there are other factors which are causing difficulties for local authorities, such as lack of resources, inadequate technical guidance, poor methods of prioritisation and increase in planning consultations relating to land affected by contamination.

The latest research in the follow up questionnaire survey identified that there were more sites with the potential to be contaminated land than were perhaps first anticipated. 46% of respondents indicated that they would require further investigation of less than 50 sites. The time that will be required by local authorities to investigate these sites will obviously be determined by resources and proposed timescales.

10.2.2 Technical Guidance Delays

The implementation of Part IIA was delayed following a number of consultations with respect to the proposed statutory guidance (see Chapter Two). The lack of technical guidance was ranked as the most significant issue by members of the focus group. At the semi-structured interview stage, only 21% felt that the guidance available to them was sufficient to enable them to implement Part IIA. Following the implementation of Part IIA there have been other delays in issuing technical guidance relating to various aspects of the implementation of Part IIA.

The DETR issued a technical advice note for local authorities Contaminated Land Inspection Strategies (DETR, May 2001). This guidance was not issued to local authorities until May 2001, that is only two months before local authorities were due to have completed their inspection strategy. Due to the

procedural implications of adopting a new strategy, it is not surprising that many local authorities failed to meet the statutory 15-month deadline.

There were several delays in issuing the CLEA model and associated soil guideline values and toxicological reports. These were not issued until March 2002, nearly two years after Part IIA was implemented. The case studies described in Chapter Eight highlight that the delays caused in issuing this guidance, made decisions about appropriate levels of risk difficult. In addition the time spent researching the applicability of appropriate site-specific values by regulators as part of the planning process is also having an impact on the effectiveness of Part IIA.

At the present time, Soil Guideline Values (SGVs) have been developed for arsenic, cadmium, chromium, lead, nickel, selenium and inorganic mercury. Interestingly, in CLR 7 a further three soil guideline values were due to be published (Benzo[a]pyrene, inorganic cyanide and phenol). At the time of completing this thesis (December, 2003) there is still some debate about the choice of an appropriate SGV with respect to these contaminants (Discussion with Alwyn Hart, Environment Agency, October 2003). It was noted in Chapter Three that the technical guidance, which is available at the present time, only relates to human health, which makes the assessment of other potential receptors identified in the Statutory Guidance difficult.

It was noted by one respondent that the Environment Agency is not sufficiently funded by DEFRA and that insufficient resources are available to produce the required guidance and promote its effective use. The same respondent also noted that the lack of Soil Guideline Values was causing difficulty in assessing contaminated land reports where no SGVs are currently available.

It has been suggested (questions to delegates at CLEA training course held at Wilmslow, June 2003b) that the SGVs for some contaminants are too conservative, due to the fact that in many areas of the country 'natural' levels of contamination are much greater. This is the case, for example, with arsenic in many urban areas.

A local authority response to the Statutory Consultation process stated that:

> *"the technical guidance should be provided before the legislation was implemented"*

It is suggested that many of the problems now faced by local authorities and environmental consultants relate to the fact that adequate technical guidance was not in place at the same time that Part IIA was brought into effect. Based on the author's own experience it is argued that Part IIA will be implemented more effectively when a comprehensive list of soil guideline values is produced for a wider range of land use scenarios. From the author's experience it appears that the ability to produce new soil guideline values is being hampered by the lack of sufficient resources and priorities of the Environment Agency.

10.2.3 Site Prioritisation Methods

The UK has adopted a suitable for use policy and Part IIA requires local authorities to prioritise land for further investigation using the principles of risk assessment. Local authorities are therefore required (as part of their strategies) to develop a method to determine which sites should be investigated under Part IIA. It has been suggested by many local authority contaminated land officers that a 'standard method' for prioritising land should have been incorporated into the Part IIA package. This would have reduced the amount of time required to assess alternative models and would have promoted consistency of approach. This thesis has examined alternative methodologies for prioritising land for further investigation.

The system developed as part of the Barnsley MBC Pilot Study provided a method through which land could be categorised according to its previous use. Sites would be placed on a GIS (FastMap) and information about each site would be stored and a subjective assessment would then be made about proximity to pathways and receptors using a similar methodology to that set out in CLR 6.

During the early stages of this research, only a limited number of local authorities had examined potential systems for prioritising potentially contaminated land. The follow up questionnaire survey revealed that over two-

thirds of respondents had examined some sort of prioritisation system. It is interesting to note that nearly a third of respondents had not examined a prioritisation model. Further information would be required from this group to identify how they intend to prioritise sites for further inspection. Of the respondents that had stated they had examined a prioritisation model, nearly half had chosen an 'off-the-shelf' package e.g. CLARA, Groundview and BGS. Interestingly, eight of the respondents stated that they had developed their own system in-house. The functionality of these models is briefly described in Chapter Three. The choice of package may depend upon whether information needs to be shared corporately and the type of GIS used, as this does have an impact on the overall cost of the prioritisation model. The cost of these packages range from approximately £3500 - £7000.

The US EPA has developed the Hazard Ranking System (see Chapter Seven) in order to establish whether a site needs to be investigated further. No such formal ranking system exists in the UK for prioritising potentially contaminated land, and local authorities may develop their own system or simply adapt existing systems. However, there are considerable differences in approaches that could lead to inconsistency in the way sites are prioritised by different local authorities. In addition, there are significant resource implications for individual local authorities having to develop their own methodology rather than being able to adopt one that has been developed by central government. The hazard ranking system has been applied to the Totley case study presented in Chapter Eight. This highlighted that the model could potentially have been adapted fairly easily for use in the UK. It is argued that having such a model would provide consistency of approach and would have significantly reduced the time required by local authorities to review alternative prioritisation models.

However, not all potentially contaminated sites may be identified as a consequence of the inspection strategy and subsequent prioritisation. The Manor Park case study described in Chapter 8 identified an area of potentially contaminated land as a result of an unrelated Council site investigation and would not have been identified as a result of the Inspection Strategy. The site may also not have been investigated as part of the planning and development control process as the site had no apparent history of a previous land use likely

to cause contamination. This can also be related to the view of one local authority EHO during the questionnaire phase:

> *"As this is a rural area, there may be sites that are not known about or where there are no longer details of planning history. All the laws in the land are not going to deal with that"* (Local authority officer, Questionnaire Survey, 2003)

In addition it is unclear at the present time how land that has 'naturally' elevated levels of contamination, above soil guideline values should be prioritised and how they are assessed further on a site-specific basis.

10.2.4 The Redevelopment Of Contaminated Land

The thesis has also considered the wider implications of Part IIA for the redevelopment of other land, which falls outside the statutory definition of 'contaminated land' but is affected by the presence of contamination.

During the focus group discussion, the consensus of the group was that the planning regime might deal with many potentially contaminated sites. It was also noted that there was a general lack of confidence in site investigation reports due to different approaches to the assessment of risk. This was confirmed by the responses from the questionnaire survey undertaken in July 1999 which suggested that, even though 33% of local authorities estimated they would identify more than 10 sites capable of been determined as contaminated land, only 10% felt that would take regulatory action. 75% of respondents felt that they would not take regulatory action. It is therefore assumed that the majority of local authorities anticipated that the majority of sites would be remediated voluntarily, either as part of the development control process or to avoid the threat of regulatory action. As one local authority respondent said:

> "*The impending legislation is raising awareness of the potential for contamination among LA's and also among many developers and house buyers. Many sites will be investigated through planning when developed."* (Local authority Officer, Questionnaire Survey, July 1999)

Provision of full information is essential to people living on contaminated land and on sites that have been developed on land affected by the presence of contamination. Experience (Syms and Knight, 2000) has shown that, provided with the full facts, people are willing to live on such land and that their perceived risk of such land is lower than other environmental risk (Syms, 1997a).

Government policy advocates the re-use of potentially contaminated land for redevelopment and has set a target that 60% of new development should be developed on such land. The current government policy, which requires local authorities to identify previously used sites for development, will have the potential impact of bringing sites forward for development that may otherwise have been assessed in terms of Part IIA. It is suggested that this would be a positive outcome, in that it removes the responsibility of enforcing remediation away from local authorities. Conversely, local authorities will be faced with an increasing amount of site investigation reports submitted as a requirement of obtaining planning consent. Therefore, staff responsible for assessing contaminated land under Part IIA may be required to spend more time assessing reports submitted as part of planning applications, in order to meet internal planning targets. This then has the knock-on effect of slowing progress with the contaminated land strategy. As one local authority officer stated:

> *"This all has to be done between dealing with a huge rise in planning applications. Basically I don't have much time to do Part IIA, as most of my time is taken up through development work."* (Local authority Officer, Questionnaire Survey, 2003)

10.2.5 Incentives to Promote the Reuse of Contaminated Land

Experience in the US suggests that the issuing of "no further action letters" and "covenants not to sue" has provided the required confidence to enable developments to proceed. Local authorities in England should not be burdened with the responsibility for 'signing-off' remediation schemes. Rather than a formal signing-off process, a post remediation verification report should be required on every scheme involving potentially contaminated land. A suggestion could be to include specific requirements in the proposed replacement of PPG 23 relating to the specific requirements of the verification report.

It is the author's opinion that the process by which consultants are required to meet certain specified criteria and be accredited by the State EPA would be beneficial in the UK. This would provide the required confidence by local authorities that site investigations have been undertaken in accordance with best practice. One suggestion from a local authority officer was that Central

Government, through a representative body such as the Environment Agency or the Chartered Institute of Environmental Health, should require any person charged with undertaking a contaminated land risk assessment to meet a required level of competency.

10.2.6 Training

Due to the delays in issuing the required technical guidance, there are training issues relating to its application in practice. Just over 40% of local authorities that responded to the follow up survey felt that they had access to adequate training. 58% of the respondents also identified a specific training requirement, the majority of which related to training on the CLEA package. The requirement, for local authority officers responsible for contaminated land to obtain the required knowledge with which to determine contaminated sites and assess planning applications on contaminated sites, will have an impact on strategy progress.

The number of training courses provided so far relating to the application of the CLEA model and associated guidance have given only a limited number of days training. It was noted by some local authority officers that this wasn't adequate, given the technical nature of the subject. It was however noted, that longer training events are not favoured by local authorities due to the fact that it "takes resources away from the office".

Due to the resources difficulties faced by many local authorities, study leave to attend a University Course specifically on contaminated land (such as that run by LQM at Nottingham University) is not a practical option. One respondent suggested the possibility of a distance-learning course leading to an accredited qualification.

The cost of training was noted to be prohibitive for a number of local authorities and it is suggested that more subsidised training could be provided by DEFRA in order to provide more access to the required training.

10.3 A METHOD FOR IDENTIFYING POTENTIALLY CONTAMINATED LAND IN BARNSLEY

The Barnsley Pilot study identified a methodology with which to identify and assess the potential for contamination and potential pollutant linkages. The system developed as part of the Barnsley MBC Pilot Study provided a method through which land could be categorised according to its previous use. Sites would be placed on a GIS (FastMap) and information about each site would be stored and a subjective assessment would then be made about proximity to pathways and receptors using a similar methodology to that set out in CLR 6. At the time the cost of purchasing specific prioritisation packages and datasets were seen as prohibitive.

At the early stages of this research programme, local authority participants had not estimated a potential timescale for the identification of contaminated land in their area. The Barnsley Pilot Study estimated that it would take two years to collate the required information and undertake an initial prioritisation. However, the estimated time to fully characterise land in terms of its potential to be determined as contaminated land was estimated to be at least 10 years.

The pilot study undertaken in collaboration with Barnsley Metropolitan Borough Council identified a number of potential barriers to the effective implementation of Part IIA. The Pilot Study revealed that information held by them may not be sufficient to provide the required confidence to enable it to designate a site as having the potential to be contaminated land. In many cases, there was an information vacuum within the local authority, which could lead to sites being ignored due to time constraints and insufficient resources.

One of the outcomes of the Barnsley Pilot Study was the lack of available resources to enable the effective identification of contaminated land and a potential 'fear factor' of a legal challenge from persons identified by the authority to be 'appropriate persons'.

The overall cost of implementing the strategy over the first three years was estimated to be approximately £135,000. The cost thereafter of employing one suitably qualified member of staff was estimated to be £26,500. It is noted that

although a different methodology was chosen as part of the adopted Barnsley strategy timescales have slipped due to resource implications. (See Chapter 6, page 139)

10.4 LOCAL AUTHORITY PREPARATIONS AND CURRENT PROGRESS

Part of the research presented in this thesis was undertaken prior to the implementation of Part IIA of the Environmental Protection Act. Therefore one of the aims of the research was to identify preparations and progress in the regulation of contaminated land by local authorities.

The focus group held in December 1998 indicated that, on the whole, there had been very little work done in preparation for the implementation of Part IIA. Reasons for this were blamed on lack of time and also a lack of political will from heads of departments. The questionnaire, which was sent to a wider group of local authorities in July 1999, identified that nearly three quarters of respondents had started some preparatory works. Nearly 10% of these respondents provided annotations to their responses which suggested that the amount of preparation was minimal. At the semi-structured interview phase, approximately 80% of the local authorities interviewed had undertaken a review of information held within their authority and held at least one interdepartmental meeting to establish future roles in relation to Part IIA.

Due to the many delays in implementing Part IIA and previous experience by some local authorities who undertook abortive preparatory works for the withdrawn S.143 registers, a number of local authorities were adopting 'a wait and see' approach.

At the time of the interview survey, there was a considerable amount of uncertainty relating to budgets and the possibility that responsible departments would not receive any additional finance to fund the regime. The lack of sufficient resources to create a strategy suggested that many local authorities might not meet the 15-month deadline for adopting a published strategy.

The follow-up survey identified that 46% of the local authorities who responded stated that existing staff had been used to develop their strategies. 23% had used external consultants and 20% had employed new staff specifically to undertake the task. The fact that nearly half of the responses identified an existing member of staff completed the strategy, suggests that there may have been difficulty in obtaining the required funding.

It appears from discussions with members of the YAHPAC group that contaminated land is very much an Environmental Health 'problem'. An internal working party group is seen as being beneficial but a number of Officers stated they were *'stretched for time'* and noted a *"general lack of co-operation from other departments"*.

At all stages of the research programme, responsibility for developing the strategy was identified as being primarily the role of the Environmental Health Department. The follow-up survey suggested that there had been a decrease in communication between internal departments in relation to contaminated land. The discussion group identified a concern about ownership of the information due to internal market systems. It was felt that in some cases a department may be unwilling to share information with another department within the same authority because they bought/owned the information. At the time of the semi-structured interviews, it appeared that most local authorities had held an inter-departmental working group meeting. From the responses received to the follow-up survey it was noted that many of these working party groups no longer meet to discuss contaminated land issues.

10.4.1 The Legal Process/ Liability

The process of identifying contaminated land and identifying the responsible person to bear the cost of remediation is seen as being particularly resources intensive. One of the outcomes of the Barnsley Pilot Study was the lack of available resources to enable the effective identification of contaminated land and a potential 'fear factor' of a legal challenge from persons identified by the authority to be 'appropriate persons'.

The potentially onerous task of establishing liability was identified by a number of local authorities:

> *"The first person to send a remediation notice, obviously I just hope it is not in our area, because it's going to tie-up, not just the legal people but the technical people for a long time, arguing through the liability and the whole of that side would just be a nightmare."* (Local authority Officer, Questionnaire Survey November 2003)

The Totley case study in Chapter Eight highlighted that local authorities may be faced with legal challenges from homeowner groups who feel aggrieved by a local authority determination, especially if they are required to fund the remediation. Even a small legal challenge could considerably delay the implementation of Part IIA due to the likely impact on resources.

One of the problems for local authorities in England, is that the time required to identify all responsible parties for the remediation of a site and the potential costs of a legal challenge may slow progress in relation to the determination of a number of sites. It is interesting that to date the majority of sites that have been determined are Council owned sites or sites where there is no apparent responsible party and the costs of remediation would fall to the 'innocent owner'. A potential option to remove this concern would be a provision within the SCA (or future replacement) scheme to enable local authorities to apply for capital expenditure to undertake such legal cases.

The process of determining land as contaminated land also requires a considerable amount of resources. A local authority has to be able to establish that there is a plausible pollutant linkage. Land cannot be identified as contaminated land unless all three elements are established. Where there are multiple pollutant linkages, local authorities must determine each pollutant linkage separately. It is not acceptable to simply issue a single determination for many pollutant linkages. This could potentially lead to excessive impacts on resources, for example, on a heavily contaminated site a local authority may have to issue over 100 separate determinations due to the number of contaminants identified, number of potential receptors and identifiable pathways.

10.4.2 Remediation

Local planning authorities, as part of their obligations under PPG 23, will normally attach conditions to planning consent which require developers to submit for approval a desk study, site investigation and, where necessary, a remediation scheme. Most local authorities will also have a requirement for some confirmation that remediation has been carried out in accordance with the remediation scheme agreed by the local authority.

Developers and local authorities are likely to face problems in agreeing new guideline values developed on a site specific basis, where an SGV has not yet been published by DEFRA for a contaminant. There is little published data available about appropriate levels of cover or treatment for sites where the risk assessment identifies that remedial treatment is required. The choice of remediation option may ultimately be market driven in order to satisfy potential future liabilities and/or perceived risks for future occupiers, in respect of historic contamination.

Government policy, which promotes the re-use of land for housing, also has an impact on the choice of remediation. Whilst the choice of 'dig and dump' is likely to be more costly, it is quicker to administer and it deals with any perception of residual risk issues that may remain should other techniques be used.

10.4.3 Searches/requests for Information

At the focus group discussion meetings, concerns had been expressed about the provision of partial or incomplete information to external parties. Information held by local authorities about potential contaminated land sites and/or special sites will also need to be assessed as part of the conveyancing process. Incomplete communication of knowledge and/or uncertainty about information held by a local authority will have an impact on lender attitude and public perception about potential liability and possible health effects.

The follow up questionnaire survey identified that the majority of local authority respondents were providing information that they held and requesting a charge for this service. It was noted from some of the responses received to the follow up survey that requests from solicitors relating to individual houses and the possibility of land being designated as contaminated land was taking up a considerable amount of time. As one local authority officer stated:

> *"I find the Envirosearch type surveys undertaken for conveyancing solicitors to be a bind. There are many occasions whereby the information given is OTT or unnecessarily disturbing to the reciprocants and also causing them more expense and ourselves time."* (Local Authority Officer, Questionnaire, 2003)

In many cases the local authority may be unable to provide a definitive answer without exposing itself to potential future liabilities.

10.5 LOCAL AUTHORITY INSPECTION STRATEGIES

This research has examined the strategic decision making processes of local authorities charged with a legal duty to identify contaminated land in their area. The Environment Agency reported that by July 2002, 94% of local authorities had published their final inspection strategies (EA, Sept 2002:13). Twenty local authorities had failed to publish their final inspection strategy, nearly 12 months after the initial deadline contained in the Statutory Guidance. In July 2003 two local authorities still had not formally adopted a written strategy (EA, Progress Report, August 2003b).

10.5.1 Information

The amount and format (digitised or paper based) of information held by local authorities was identified as having a significant impact on local authority progress. The pilot study undertaken by Barnsley Metropolitan Borough Council revealed that information held by it may not be sufficient to provide the required confidence to enable them to designate a site as having the potential to be contaminated land. In many cases there was an information vacuum within the local authority, which could lead to sites being ignored due to time constraints and insufficient resources.

The questionnaire survey (1999) revealed that a quarter of local authorities had all the information they required to implement Part IIA, with nearly two thirds of local authorities stating they had insufficient information. The remaining respondents did not know whether they had sufficient information. The semi-structured interviews suggested a slight increase with 20 local authorities stating they had all the required data. The follow-up questionnaire survey (2003) revealed that nearly two-thirds now had sufficient information to enable decisions to be made about a site's potential to be contaminated land. Those that stated they did not have sufficient information, indicated that they would require more site-specific data obtained by soil sampling. The collation of such information will be effected by resources and local authorities may delay taking action where there may be different interpretations placed on site-specific analysis.

10.5.2 GIS and Data Management

The use of Geographical Information Systems (GIS) for storing information relating to contaminated land has a significant role as part of local authority strategies. Responses to the questionnaire identified that 95% of the local authorities would use a GIS for storing their contaminated land data. For the 5% that were undecided, the reason given for this indecision was, either lack of provision in the budget or potential technical difficulties of updating an existing system. During the Pilot Study and the semi-structured interview phase there were a number of potential problems relating to the choice of GIS that were being encountered by the departments responsible for implementing Part IIA. A number of local authorities expressed a desire to develop a system on a corporate GIS, even though a corporate decision about which GIS software package to choose was not likely in the near future. There are a number of prioritisation packages which have been developed that will only operate on a limited number of GIS software packages. In some circumstances, local authorities were required to undertake further research to establish whether the 'contaminated land GIS' could read other information held on other GIS held by other internal departments.

10.5.3 Timescales

At the early stages of this research programme, local authority participants had not estimated a potential timescale for the identification of contaminated land in their area. The Barnsley Pilot Study estimated that it would take two years to collate the required information and undertake an initial prioritisation. However, the estimated time to fully characterise land in terms of its potential to be determined as contaminated land was estimated to be at least 10 years. One local authority stated during the interview phase that a:

> *"Comprehensive study required as follow-on to strategy – will take several years"*
> *(Local authority Officer, Interview Phase July, 2000)*

In the follow up questionnaire (2003), all of the respondents stated that they had experienced delays with their implementation strategy. Reasons that were stated included:

- *lack of resources,*
- *not enough staff or staff changes,*
- *underestimates of the number of potentially contaminated sites,*
- *technical difficulties with GIS software and;*
- *lack of technical published guidance.* (Questionnaire Survey, 2003)

Only one local authority stated that they had not encountered any delays in relation to the implementation of their strategy. Interestingly, that local authority had undertaken a significant amount of work at the interview stage of this research and had already secured internal funding with which to implement the proposed legislation.

The majority of respondents provided reasons for this delay. 74% stated that this had been caused by a lack of resources. Other responses included:

- *Pressures of other work*
- *Sites are coming through as part of planning process, which is taking resources away from Part IIA.*
- *Failure to receive required GIS training*
- *Lack of Staff*

- *Amount of sites greatly underestimated* (Questionnaire Survey, 2003)

For those Officers who are responsible for other work such as IPPC and nuisance issues, there may be increased difficulties in relation to the effective implementation of Part IIA. This is because local authorities now have additional duties in regulating certain prescribed processes under the new IPPC regime, some of which need to be assessed in a significant amount of detail.

10.5.4 Political Importance

The political importance placed on contaminated land issues was seen by many local authorities as a significant barrier to progress in relation to the effective implementation of Part IIA. As one local authority respondent stated during the focus group:

> *"I rather suspect that this is one of these issues that people will leave, and it won't rise up the political agenda as there are no resources, no commitment to do it and no actual enthusiasm any higher to raise the issue."* (Local Authority Officer, Questionnaire Survey, 2003)

The follow up survey (2003) revealed that only 15% identified contaminated land as a high political priority for their local authority. The results of this survey also suggested that only 42% of local authorities felt that Part IIA would effectively deal with contaminated land in their area. This compares with 58% during the interview phase. The fact that contaminated land has been given a relatively low priority at a local political level is having an impact on the amount of resources that responsible departments can obtain to implement Part IIA. One local authority EHO stated:

> *"Contaminated land is not a widely recognised issue...and because of this there is little political pressure to take the strategy forward."* (Local Authority Officer, Questionnaire Survey, 2003)

10.6 THE COST OF IMPLEMENTING PART IIA

It was noted at the Second Environment Select Committee review of contaminated land, that no funding had been proposed in the first consultation draft of the Statutory Guidance to assist local authorities implement Part IIA. The lack of funding was seen as a major barrier to the likely ability of local authorities to identify contaminated land effectively in accordance with Part IIA.

At the Select Committee enquiry, the DoE suggested £12m to cover administrative costs, which equates to less than £35,000 per authority (although the amount will differ depending on the size and population of the authority). This is actually less than the amount allocated for the withdrawn proposals for S143 registers, which was arguably a much less onerous task.

Prior to the introduction of Part IIA the DETR (formerly known as the DoE) stated that £12m would be provided to local authorities to assist in drawing up strategies for the identification of contaminated land. This money was not 'ring-fenced' and was allocated as part of each local authority's standard spending assessment. Individual local authorities could therefore decide the political importance attributed to the regulation of contaminated land and set its own budgets, which may be considerably less than that actually allocated by central government.

The cost of implementing Part IIA was identified as having a significant impact on the potential strategies adopted by individual local authorities. Through this research programme one of the aims has been to identify the costs associated with the implementation of Part IIA.

At all stages of the research programme, resources were identified as a potential problem by all local authorities. Typical responses related to a requirement for additional staff, more investment in information technology and software to store data collected as a result of implementing their strategy. The requirement for additional training in order to keep pace with new guidance being issued was seen as a drain on resources. Typical responses regarding resources are provided below:

> *"Lack of resources – neither of the officers responsible for implementing the strategy are assigned solely to the task"* (Local Authority Officer, Questionnaire Survey, 2003)

> *"Most people within the LA are in denial regarding this statutory duty, we do not currently have the resources and do not look likely to get any to allow successful implementation."* (Local Authority Officer, Questionnaire Survey, 2003)

At the focus group stage, none of the local authorities represented had identified likely cost implications. The questionnaire sent in July 1999 identified

that only a small proportion of local authorities (14%) had estimated a cost to implement the provisions of Part IIA. These costs were assessed purely in terms of additional staff and investment in computer software and digitised datasets. The average cost to implement the strategy was £35,000pa. The minimum being £15,000 and the maximum £120,000.

At the follow-up stage, it was noted from the responses received that the average cost per local authority is £27,500, which is approximately the cost of employing one full time Officer. The follow up survey also identified that 32% of respondents had to rely on existing budgets and had been unable to receive any new allocation of resources. Whilst this survey can only be indicative, due to the number of responses received, it appears that most local authorities have not been able to access money allocated for the implementation of Part IIA.

A constant theme that emerged throughout the research programme was the feeling that funding should have been specifically 'ringfenced' for use in relation to Part IIA. For example one local authority officer in the follow-up survey stated that:

> *"Legislation does not provide the right result unless fully funded (& ringfenced funded)"* (Local authority Officer, Questionnaire Survey, 2003)

It was highlighted in Chapter Two that the Government felt that it was inappropriate to 'ring-fence' specific amounts of money for individual local authorities, as it takes away local accountability (Malcolm Lowe, 1999: pg, 37). It is noted more recently in other areas of government policy that there has been a change relating to specific amounts of money that have been 'ring-fenced' for the provision of extra education and social care provision. It is therefore a possibility that this new precedent may also now be applied to contaminated land.

10.6.1 Supplementary Credit Approval

In cases where pollutant linkages are identified the consensus of the majority of local authorities was that SCA would have to be used to fund a proper scientifically based risk assessment. However, as one respondent stated:

> *"The main barrier that I can foresee is the securement of funding for the investigation stage of the strategy. I know SCA is a source but on a site by site basis this is only going to stall the process further"* (Local Authority Officer, Questionnaire Survey, 2003)

The case studies described in Chapter 8 identified that the costs of undertaking investigations are prohibitive and are likely to be met with lengthy delays whilst decisions are made as to what is undertaken and at what cost. (This was noted in relation to Supplementary Credit Approval and the length of time it took from applying to DETR to finally getting permission from the relevant local authority committee to spend the finance).

It is also interesting to note the apparent discrepancy between the way in which the SCA allocation has been administered for local authorities' air quality monitoring, and the way in which it is administered for the contaminated land regime. Under Air Quality regime it is possible to apply for SCA funding to purchase any equipment that might be required to undertake their statutory function. Within the SCA scheme administered for the Part IIA regime it is only possible to apply for credit approval for intrusive investigations or remedial actions. It is argued that local authorities should have been able to apply for SCA funding to purchase GIS software, prioritisation tools and digitised data using this source of funding. (It is the author's opinion that this meets the necessary criteria of capital expenditure). The revenue funding provided to local authorities could then be available to fund the necessary staff to implement the legislation.

In addition, it has been suggested as part of this research that consideration should be given to the expansion of the Supplementary Credit Approval scheme or similar to enable local authorities to use the capital expenditure budget to employ suitably qualified lawyers. This may have the effect of reducing some of

the potential resource issues that may otherwise be faced by local authorities in defending a legal challenge.

In relation to this aspect, it should be noted that the SCA budget of £12m has been considerably under spent (i.e. less than half) year on year since Part IIA was implemented. Despite some of the problems relating to the funding mechanism, the provision of SCA is seen by some local authorities as essential:

> *"Without the possibility of obtaining SCA it is unlikely that the Council would have been able to have undertaken such a thorough investigation and may have led to different conclusions eventually being reached"* (Principal Officer, Sheffield City Council).

10.6.2 Cost Benefits

In deciding what remediation is required, the enforcing authority is required to have regard to the cost which is likely to be involved S.78E (4) (a) and the seriousness of the harm, or pollution of controlled waters in question S.78E (4)(b). This cost-benefit analysis approach is likely to provide local authorities with some complicated dilemmas especially where there are potential health risks. For example the case study in Chapter 8 at Manor Park, Sheffield, involved nearly 1000 properties and, had this area required remediation, could potentially have cost the local authority nearly £2million.

The cost for undertaking the remediation and re-instatement of 15 gardens has been approximately £600,000. A third of this cost can be attributed to the decision to re-instate gardens. There were also additional costs incurred in assessing the potential costs and future long-term liabilities of removing established trees. It is estimated that the final cost of remediating all 27 gardens will be in the region of £1 million.

However, the Council felt that it would be unfair to penalise the original owners who had intended to move before the elevated levels of lead were identified. Had the Council not taken this decision, it is likely that the properties would not have sold, because the average cost of remediating each garden is in excess of £20,000. There may also be wider physcological impacts of remediation works on individual people's health, which may be greater that the potential health risk

associated with some contaminants. It is suggested that, in certain circumstances, the cost of removing contaminated material may not outweigh the benefits.

10.7 EXAMPLES OF LOCAL AUTHORITY REGULATORY ACTION

The case studies provided in Chapter Eight and the Barnsley Pilot Study identified examples of local authority developments in relation to the regulation of contaminated land. The Barnsley Pilot Study proved the difficulty of identifying land for further inspection. The Manor Park case study identified the difficulty in assessing risks from contaminated land where there are no appropriate risk assessment criteria. Due to the timing of the site investigation, no soil guideline values were available to assess the potential risk to residents on the estate. The consultants used a method similar to that of the CLEA model but were not as conservative in their assumptions. This has therefore led to a potential underestimate of the risk at some individual properties, when compared against the current SGVs, and may require further investigation. Other local authorities may be unwilling to investigate sites where an SGV is required but has not yet been developed, for fear of having to re-investigate land that they previously stated was 'safe'.

The Totley case study identified that a considerable amount of time was spent by the local authority in dealing with residents' problems and concerns about the site investigation and remediation process.

The management of the Totley project effectively required one person full time to deal with the planning, tendering process, complaints, telephone enquiries (by residents, internal staff and media) and to oversee the project. This responsibility was divided between two officers. This has had a significant knock-on effect in terms of the effective implementation of the contaminated land strategy, which is likely to take an additional two years to gather all the necessary information with which to prioritise all sites. There are also 'knock-on' effects, such as not being able to meet internal response targets in relation to contaminated land consultations with the Planning Department.

10.7.1 Remediation Issues in Relation to Part IIA

The costs of undertaking remediation works in close proximity to existing buildings, other structures and live services are considerable. The difficulties of undertaking remediation in such circumstances can be summarised as:

- *Boundary disputes – even though these were measured accurately prior to the works by the Council and the Contractor, there were some delays whilst residents complained about the fact that the boundary didn't necessarily match with the one in their deeds. The Council had always stated that it was replacing like with like and that any boundary disputes could not affect the works. Such matters would have to be taken up privately.*
- *There were some complaints of damage to property e.g. drives and superficial cracking of some rendering in two properties used as access for most of the garden areas.*
- *The fact that the site was occupied meant that residents wanted to be involved in the process, which tended to cause problems with progress.*

It may be questioned whether the cost of undertaking remediation in all circumstances is beneficial, especially taking into account the potentially harmful effects of stress that may be placed on an individual. There was also the concern raised by some occupants about the fact that they were being exposed to more of the potentially harmful dust than they would have ever been exposed to under normal conditions.

Many of the affected residents felt that the Council was wasting its time, and did not believe that there was a risk to health from the lead in their soil. The potential impacts on property value of appearing on a register were of greater concern.

10.8 SUMMARY – PROBLEMS AND SOLUTIONS

This Chapter has critically evaluated the findings of the research in relation to the key issues highlighted in the literature review. The evaluation identifies eleven key problem areas currently being faced by local authorities, which are having an impact on the effective implementation of Part IIA. The problems highlighted by this research are listed below along with potential solutions, which are based on responses to the empirical data and the author's own experience.

10.8.1 Lack of Resources

All stages of the research have identified that local authorities are struggling to implement Part IIA due to an overall lack of resources. Even at the face-to-face interview stage most local authorities departments responsible for implementing Part IIA had not yet managed to secure any additional funding from central local authority budgets. The follow-up survey identified that most authorities now had a dedicated contaminated land officer assigned to the task of implementing Part IIA, although budgets were not always sufficient to pay for the necessary training or purchasing necessary technology. Section 10.6 has discussed the findings of the research in relation to local authority resources. It is suggested that the failure to obtain the necessary funding is mainly down to the general low level of priority given to contaminated land at a local level and the fact that the funding given to local authorities by central government was not 'ring-fenced'.

Solution – It appears from the evidence presented in this thesis that the average level of revenue received by many local authority departments is less than £30,000 to implement Part IIA. This is only sufficient to pay the salary of one member of staff solely dedicated to implementing Part IIA and little else. It is therefore suggested that consideration is given to increasing the amount of revenue funding provided to local authorities through the standard spending assessment budget for contaminated land. Other solutions include making local authorities accountable for their actions under Part IIA by the use of performance indicators and 'ring-fencing' revenue specifically for contaminated land.

10.8.2 Current Funding Regime

There are two methods of funding applicable to Part IIA. There is the revenue funding received through the standard spending assessment which is provided to local authorities each year by central government. It has been highlighted above that the failure to 'ring-fence' specific revenue within local authority budgets specifically for contaminated land has led to delays in implementing Part IIA due to local authority departments failing to obtain the necessary revenue. Under the current method of funding, revenue that local authorities receive is intended to pay for additional staff, computer hardware and software, inspection duties, training and the legal costs necessary to deal with any legal

challenges to local authority regulatory duties. Supplementary credit approval is available to local authorities only for site investigations and remediation. In addition to the restrictive use of SCA funding, Section 10.6.1 has highlighted problems related to the time it takes to secure funding and obtain the necessary internal permissions to spend the money.

Solution – It is suggested that funding specifically intended for local authority Part IIA implementation is either 'ring-fenced' as suggested by a number of local authorities throughout this research programme or that greater clarity should be provided to enable local authority departments to identify exactly how much they should receive. It is suggested that if the latter was linked to increasing political accountability at a local level then there may be effective implementation of Part IIA by local authorities. This research has highlighted that the current scope of SCA funding is too restrictive and it is argued that the scheme could be expanded to enable capital expenditure on any items related to the regulation of contaminated land. This may relate to computer hardware, historic mapping, prioritisation packages and legal assistance.

10.8.3 Insufficient Technical Guidance

The implementation of Part IIA has historically suffered from a number of delays. Part IIA was brought into force nearly five years after the primary legislation was included in the Environment Act 1995. When the legislation was eventually brought into force local authorities were not provided with the necessary guidance to implement the legislation. It has been noted in this thesis that there were delays in providing guidance relating to the production of inspection strategies, technical guidance relating to soil guideline values and the production of the CLEA model. Section 10.2.2 highlights these technical delays and it is suggested that the current lack of technical guidance is having a significant impact on the implementation of Part IIA and is having a 'knock-on' effect in terms of the assessment of land affected by contamination for development purposes.

Solution – The research has highlighted a number of areas that need to be addressed in relation to currently available technical guidance, namely:

- *there needs to be a quick release of SGVs for a wider range of land use scenarios and receptors*
- *there needs to be guidance about the assessment of naturally contaminated land, as many areas in England are 'naturally' elevated above the SGV for some contaminants e.g. arsenic*

- *there needs to be additional guidance relating to site-specific risk assessment criteria – it is suggested that the Hazard Ranking System described in chapter seven provides a transparent mechanism for determining whether land is 'contaminated land'.*
- *That further research and guidance is provided relating to bioaccessibility testing and its applicability when undertaking site-specific risk assessments*
- *There needs to be more political accountability in relation to the publication of new guidance. It is noted that the Environment Agency, who currently manage the contaminated land research programme on behalf of DEFRA are struggling to retain staff and produce the necessary guidance.*

If the above points are addressed it is suggested that local authorities will have the necessary tools in place to implement Part IIA more effectively. In order to address the above issues it will be necessary for central government to provide the necessary funding and mechanisms for accountability.

10.8.4 Low Political Priority

Section 10.5.4 highlights the fact that at the present time there is a low level of political importance placed on contaminated land issues by local authorities. This was seen by many local authority officers responsible for implementing Part IIA as a significant barrier to progress in relation to the effective implementation of Part IIA.

Solution – It is argued that making individual local authorities more accountable would increase the level of regulatory activity in relation to contaminated land. It is suggested that the most appropriate mechanism for achieving this would be by producing performance indicators. The performance indicators could potentially be linked to revenue funding and those authorities that demonstrate more regulatory activity receiving additional revenue funding. The design of such a performance indicator would have to be considered carefully in order to take into account the additional workload currently identified as a result of the increase in development on land affected by contamination.

10.8.5 Inspection Strategy Timescales

Progress with local authority inspection strategies has been evaluated in Section 10.5.3. The lack of resources has had a significant impact on local authority timescales. All of the local authorities, which responded to the follow up questionnaire survey, identified that their original timescales for prioritising land had passed. In some cases this task was now expected to take more than ten years. Unsuccessful attempts have been made by a number of local

authorities to obtain additional internal resources in order to speed up the Part IIA process. In addition local authorities are now being required to undertake other additional regulatory duties in assessing A2 authorised processes under the new IPPC regime. In some authorities this may have the effect of removing resources away from the regulation of contaminated land. Some of the delays caused to local authority strategies have been caused by loss of staff and loss of expertise relating to contaminated land. This loss of knowledge may have an impact when undertaking risk assessments of land and make the duty more onerous and time consuming.

Solution – It is suggested that changes to the level of revenue received by local authorities, the provision of the necessary technical guidance and increased accountability would all lead to increased progress by local authorities with respect to the implementation of Part IIA. Broadening the scope of supplementary credit approval may also help local authorities implement their inspection strategies. It is argued that the above solutions may also assist local authorities in retaining staff, as they would then be able to provide more training and offer higher salaries.

10.8.6 Prioritisation Methods

Section 10.2.3 highlights some of the difficulties faced by local authorities in prioritising areas of land for further inspection. The research has identified that whilst the majority of local authorities felt that they had sufficient information to identify potentially contaminated land a significant number of 'high risk' sites are being generated by some site prioritisation packages. This is requiring additional work by local authorities in refining software in order to limit the number of sites that fall within the high-risk category. This is having an impact on the delivery of Part IIA and could have been avoided had a suitable method been developed by central government prior to the implementation of Part IIA.

Solution- It is noted that no formal prioritisation model was developed by the government prior to the implementation of Part IIA. It is suggested that a model similar to the HRS model described in Chapter Seven should have been prepared for use by local authorities in England. Indeed such a scoring system may still be beneficial to local authorities that require additional confidence as to whether a site is contaminated. It is argued that the use of a clear scoring system based on contaminant type and proximity to receptor etc would assist local authorities in their decision-making processes.

10.8.7 Legal Challenges

Part IIA requires local authorities to identify contaminated land. At the present time there is a lack of technical guidance available to assist local authorities. The lack of guidance is also having an impact on local authority confidence relating to the legal issues regarding contaminated land. Section 10.4.1 highlights the findings of this research relating to this topic. The process of identifying contaminated land and identifying the responsible person to bear the cost of remediation is seen as being particularly resources intensive. There is a potential 'fear factor' of a legal challenge from persons identified by the authority to be 'appropriate persons'. Even a small legal challenge could considerably delay the implementation of Part IIA due to the likely impact on resources.

Solution – Provide local authorities with the necessary technical guidance and training solutions (suggested below), which would have the impact of raising confidence levels should any legal challenge occur. Finally it is suggested that the scope of SCA is broadened to enable the capital expenditure of funds to fund any Part IIA legal case.

10.8.8 Remediation Issues

Section 10.7.1 identifies a number of difficulties for local authorities faced with undertaking remediation under the Part IIA regime. The costs of undertaking remediation works in close proximity to existing buildings, other structures and live services are considerable. There can be problems, relating to boundary disputes, topography, existing services, residents remaining in-situ, heave, access, communication etc. The cost of removing soil to landfill will increase considerably over the next few years due to changes in waste acceptance criteria. It may be questioned whether the cost of undertaking remediation in all circumstances is beneficial, especially taking into account the potentially harmful effects of stress that may be placed on an individual. There was also the concern raised by some occupants about the fact that they were being exposed to more of the potentially harmful dust than they would have ever been exposed to under normal conditions.

Solution – the production of technical guidance relating to site specific assessment may assist local authorities as it may reduce the number of sites that require physical remediation. Consideration needs to be given as to what extent an 'information' or 'advisory' note has in terms of remediation especially in relation to some of the heavy metal contamination. In addition it is recommended that further guidance be produced relating to the remediation of land identified under Part IIA as there is a current gap in available literature relating to the subject. Provision of such guidance would provide local authorities with additional confidence when faced with the prospect of dealing with such sites and assist in the effective implementation of Part IIA.

10.8.9 Information Requests

The introduction of Part IIA has brought about a new task for local authorities. Section 10.4.3 highlights the fact that requests from solicitors relating to individual houses and the possibility of land being designated as contaminated land was taking up a considerable amount of time. In many cases the local authority may be unable to provide a definitive answer without exposing itself to potential future liabilities. These searches are useful in that they flag up additional environmental information that previously was not available. However there appears to be a lack of understanding regarding what the searches mean from solicitors undertaking the searches on behalf of their clients. These searches are deflecting attention and resources away from the implementation of Part IIA

Solution – The easiest way to deal with this problem would be to amend the statutory guidance and exclude homeowners from the costs of remediation. An alternative suggestion is that guidance and training is provided to solicitors through the UK law Association about how these reports should be interpreted. It appears unfair to expect local authorities to amend their strategies on the strength of an information request. In addition it is suggested that the wording on these search could be amended. In many cases that the author has had experience of the search suggests that a land may have the potential to cause significant harm even though it is situated a considerable distance from a potential source of contamination. It was noted in Chapter seven that government agencies provided more information on the internet. It is suggested that with the necessary caveats local authorities could share more data relating to land contamination on the internet.

10.8.10 Provision of Training

Section 10.2.6 identified that there is a current lack of suitable courses and training available to local authorities and consultants at affordable prices. The

CLEA model and supporting technical guidance has required local authority staff responsible for contaminated land to undertake training in order to use the guidance correctly. This research has identified a requirement for additional training on the application of the CLEA model on a more technical nature than that already provided. Such training may have to be subsidised to enable local authority delegates to attend. At the present time there is no suitable accreditation for contaminated land officers and consultants relating to the risk assessment of contaminated land.

Solution – That additional training is provided in liaison with local authorities and consultants, which is subsidised to the extent that it is affordable e.g. less than £200. It is also recommended that consideration be given to the development of a distance-learning course with exam that leads to a recognised accreditation of proficiency. This is similar to the accreditation given to consultants in Ohio. It is argued that this would lead to a consistent approach with respect to risk assessment and make legal challenges relating to risk assessment less likely. Again it is recommended that such courses should be subsidised or that SCA funding should be broadened in order to cover the cost of training.

10.8.11 Increased Development on Previously used land

Section 10.2.4 identified that government policy, which is encouraging the re-use of potentially contaminated land for development, is having a positive effect on the amount of land that may otherwise have had to be investigated under Part IIA. However, reviewing contaminated land risk assessment submitted as part of the planning process is having a considerable knock-on effect on local authority officers' time, which they can give to Part IIA. This additional burden on local authorities does not appear to have been fully recognised by central government. The lack of additional technical guidance is also having an impact on the time it takes to assess the conclusions of site investigation reports. The introduction of Part IIA and supporting technical guidance has had the effect of increasing standards of assessment and remediation by developers. In 2001, sixty-one percent of new development was on brownfield land. It has been questioned whether this target will continue to be met in the future, as sites become more uneconomical to develop. It is therefore likely that additional financial incentives to developers will be required to maintain present targets.

Solution – It is suggested that the provision of additional guidance and training will speed up the assessment of land affected by contamination. This will have the positive effect of increasing available officer time to implement Part IIA. Other solutions suggested above would also have a positive impact in this respect e.g. changes to the revenue system and the introduction of performance indicators

Chapter 11 draws on the evaluation of data presented in this Chapter to provide conclusions relating to the overall aim and objectives. Chapter 11 also provides suggestions for further research.

CHAPTER 11
CONCLUSIONS AND RECOMMENDATIONS

11.1 INTRODUCTION

The overall aim of the research was to critically assess the current regulatory framework for the identification and remediation of contaminated land and establish whether local authorities can effectively identify contaminated land given the current level of resources and technical guidance.

A number of research objectives were generated in order that local authority regulation of contaminated land could be evaluated. The literature review identified a long history in relation to a definitive policy towards contaminated land. The review highlighted a number of delays in delivering contaminated land guidance, which is still apparent today. At the time of completing this thesis Part IIA has only been in place for a relatively short period of time and there is very little academic literature relating to the implementation of Part IIA.

During the early stages of the research programme the author entered into a formal collaboration with Barnsley MBC to develop a pilot strategy for contaminated land. The results of this collaboration are presented in Chapter six of this thesis. The collaboration identified a number of potential barriers to the effective implementation of Part IIA, such as the cost to the authority, lack of technical expertise, lack of guidance and data management issues. It was suggested that the initial prioritisation could be undertaken in approximately two years with further assessment taking a much greater time period. Many of the research questions used to evaluate the effective implementation of Part IIA were developed as a result of the Barnsley Collaboration.

The research has evaluated a system of regulation in Cleveland, Ohio and suggested areas of policy that could be applied in England. It is argued that the Hazard Ranking System should have been adapted for the UK in order to assist in the prioritisation of potentially contaminated land. In addition it is recommended that a level of competency should be attained by

consultants and regulators in relation to the assessment of risk for contaminated land.

This research has monitored local authority progress in relation to the implementation of Part IIA over a six-year period. The initial research identified that local authorities were adopting a 'wait and see' approach before making many preparations for the implementation of Part IIA. This lack of preparation is understandable given previous decisions to withdraw Section 143 from the Environmental Protection Act 1990 and the subsequent delays in developing statutory guidance.

The findings from this research have identified that local authorities are using different strategies in order to prioritise land for further inspection. There has been significant slippage in relation to progress with inspection strategies which has been caused by a number of factors, such as limited resources, difficulty in interpreting relevant information and the significant number of 'high' risk sites identified by existing methods of prioritisation.

Due to the relatively short period of time that Part IIA has been in place very few examples of regulatory action could be identified. The author has been able to draw upon personal experience in relation to two sites investigated by Sheffield City Council. The case studies presented in this thesis have identified the difficulties in the interpretation and analysis of data on contaminated land, especially in circumstances where there is a lack of technical data about acceptable levels of risk. The research has identified that where land is determined as contaminated land there are a number of significant implications for local authorities. It is suggested that the burden could be even greater in circumstances where there is a legal challenge to a local authorities decision.

This research has highlighted that many local authorities do not at the present time have sufficient resources available to them to implement Part IIA effectively. Data collected from this research identified that the average level revenue currently allocated to relevant local authority departments is less that £30,000. It is suggested that this is only sufficient to employ one member of staff and is not adequate to enable expenditure on other information relevant to

the implementation of inspection strategies. It appears that many local authorities are managing to provide a contaminated land function but if a site were to require action may face considerable difficulties.

This research identifies a lack of political will at a local level. At present time there is no evidence that local authorities are being held publicly accountable in relation to progress with the implementation of their inspection strategies. It is therefore likely that given the current level of resources, technical guidance and lack of accountability local authorities will continue to make slow progress in determining land as contaminated.

The planning regime has been successful in bringing potentially contaminated sites forward for redevelopment. However, this has required extra input from local authority officers dealing with contaminated land which has not been taken into account within current available resources and is having the effect of reducing progress on Part IIA.

Eleven potential problems have been identified which are having an impact on the effective implementation of Part IIA. This research has identified potential solutions to these problems, which are largely caused by a lack of resources due to the low priority given to contaminated land issues by local authorities. This research has also identified considerable delays in local authority timescales for identifying contaminated land and it is argued that additional funding would enable more effective implementation of Part IIA. It is suggested that consideration be given to 'ringfencing' funds for contaminated land and broadening the scope of the SCA scheme.

In addition the lack of technical guidance is a significant barrier to the effective implementation of Part IIA. It is suggested that central government should provide the necessary resources to develop the required soil guideline values and toxicological reports. The development of new guidance should be given a strict timescale in terms of delivery with a system of accountability where guidance is not forthcoming. Without the necessary guidance local authorities will continue to struggle to implement Part IIA effectively.

11.2 RESEARCH ISSUES

This research programme used a number of different research methods in order to satisfy the research objectives. The focus discussion group and the Barnsley collaborative study provided a baseline of local authority progress in preparing for the implementation of Part IIA. It had initially been the intention to undertake a number of focus discussion groups with local authority groups in other areas of the Country, but delays in implementing the Part IIA regime and lack of progress by local authorities restricted this possibility. If sufficient funding were available it would be desirable to undertake a formal discussion within regional local authority groups across England to monitor progress in relation to the implementation of Part IIA.

The questionnaire survey was undertaken as a cost-effective means of data collection at a time when the government had announced further delays in implementing Part IIA. The questionnaire was sent to a wider group of local authorities than Yorkshire and Humberside and the East Midland Regions and enabled the research to be examined in the context of England. Responses were not as high as initially anticipated because unknown to the author a similar questionnaire had been sent one month earlier with the support of the CIEH. The main weakness of undertaking the questionnaire survey was the inability to ask further questions. This was also noted during the follow-up questionnaire where there were some questions that were misinterpreted.

Just following the implementation of Part IIA semi-structured interviews were undertaken with 40 local authorities in the Yorkshire and Humber and East Midland Regions. Interviews were undertaken, rather than a questionnaire in order that responses could be probed further which enabled a better understanding of the issues faced by local authorities. If sufficient financial assistance had been available then it would have been desirable to widen the area of research to other areas of England.

11.3 POTENTIAL AREAS OF FURTHER RESEARCH

Part IIA has been in force for three and a half years and this research has identified that many local authorities in the Yorkshire and Humber and East Midlands have made progress in publishing their strategies and identifying potential sites for further investigation. This research has also identified a number of problems faced by local authorities, as a result of current policy, which is making progress with the implementation of Part IIA difficult. The additional responsibility to regulate A2 IPPC processes and the low political priority given to contaminated land by individual local authorities may result in the piecemeal regulation of contaminated land. Further studies will be required in the future in order to continue to monitor progress especially if any of the proposed solutions presented in Section 10.8 are adopted.

Research evaluating the overall cost benefit of Part IIA following its implementation, could explore the 'real' costs of implementation along with 'unseen' time lost due to inadequate technical guidance. Such research could refine the number of sites estimated to be contaminated land and measure costs of implementation in relation to local authority regulatory activity. A relevant piece of research in relation to this would be to measure the impact of regulatory action on residents' state of 'well being'. It is suggested in the Totley Case Study that the physcological impacts of undertaking the remediation of contaminated soil from gardens may have had a greater impact on residents' health. Such research could also be related to residents' perception of risk as studied by Syms (1997b) in the Joseph Rowntree report *The Redevelopment Of Contaminated Land for Housing Use.*

Further research is suggested examining the extent to which local authorities are researching past history in order to identify appropriate persons and whether there is a reluctance to undertake these searches due to potential legal challenges. It would appear from a study of currently determined sites that the majority has fallen to the relevant local authority to undertake remediation or investigation using SCA money. Such a study could also examine more closely the alternative strategies adopted by local authorities with respect to the 'hardship' provisions allowed in the Statutory Guidance.

Environment Agency data presented on page 97 of this thesis identify a number of sites, which have now been determined as contaminated land and will be the subject of remedial actions. There is now the possibility of undertaking a research project that identifies a number of potential case studies and identifies the different strategies for assessing liabilities, communicating risk and the impacts on local authority resources.

The questionnaire survey undertaken in November 2003 shows that local authorities are experiencing problems implementing Part IIA due to increased requests for information as part of the conveyancing process. The conveyancing process has previously been considered by Miles Keeping at Oxford Brookes University (Keeping, 1998). It is suggested that the aim of such research could be to identify and critically assess the extent to which the potential for contamination is now being considered and interpreted as part of the conveyancing process.

Finally, research could be undertaken in order to Identify whether the redevelopment process is still having some impact on removing potential Part IIA sites from investigation by local authorities, or whether the easiest sites have been 'cherry picked' and the rest will be left to local authorities. Such an investigation would require the involvement of local authority planners and environmental health departments as well as the participation of developers and regional development agencies. The use of innovative financial incentives could be further explored as part of this research.

GLOSSARY OF TERMS

Acute exposure	Short-term exposure to, or contact with, a chemical. (EA, 2002a:127)
Apportionment:	any determination by the enforcing authority under section 78F(7) (that is, a division of the costs of carrying out any remediation action between two or more appropriate persons). (DETR, 2000a:156)
Appropriate person:	defined in section 78A(9) as: "any person who is an appropriate person, determined in accordance with section 78F..., to bear responsibility for any thing which is to be done by way of remediation in any particular case." (DETR, 2000a:156)
Assessment action:	a remediation action falling within the definition of remediation in section 78A(7)(a), that is the doing of anything for the purpose of assessing the condition of the contaminated land *in* question, or any controlled waters affected by that land or any land adjoining or adjacent to that land. (DETR, 2000a:156)
Average daily exposure	The average daily amount of a contaminant to which a critical human receptor is exposed over the duration of exposure. (EA, 2002a:127)
Averaging time	Time period over which exposure is aggregated and averaged. This varies according to the conceptual model and the toxicological end-point of the chemical assessed. (EA, 2002a:127)
Averaging area	An averaging area (or area of interest) is that area (together with a consideration of depth) of soil to which a receptor is exposed or which otherwise contributes to the creation of hazardous conditions. The soil in the averaging area will contain variable concentrations of contaminants, which, when averaged across the area, will provide a representative indicator of how much contaminant the receptor is exposed to. EA 2002b:13)
Bioaccessibility	The fraction of a substance that is available for absorption by an organism. For example, the oral bioaccessibility of a substance is the proportion that is soluble in gastric juices. It represents only a part of the process of absorption. (EA, 2002a:127)
Bioavailability	The fraction of the chemical that can be absorbed by the body through the gastrointestinal system, the pulmonary system and the skin. Absolute bioavailability is measured as a fraction of the intake dose. Relative bioavailability refers to comparative bioavailabilities of different forms of a substance for different exposure media (e.g. soil, water, food) and routes (e.g. ingestion/inhalation). By its definition, bioavailability also includes the processes of bioaccessibility. (EA, 2002a:127)
Brownfield Land	any areas of land which have previously been the subject of a man-made or non-agricultural use of any type. This would include industrial uses such as chemical works, heavy engineering, ship-building and textile processing, together with unfit housing clearance sites and docklands....as well as mineral extraction sites and those used for landfill purposes. (Syms, 1994)
Building:	any structure or erection, and any part of a building including any part below ground, but not including plant or machinery comprised in a building. (DETR, 2000a:156)
Charging notice:	a notice placing a legal charge on land served under section 78P(3)(b) by an enforcing authority to enable the authority to recover from the appropriate person any reasonable cost incurred by the authority in carrying out remediation. (DETR, 2000a:156)
Chemical exposure rate	The amount of a chemical in water, food, air, or soil that enters the human body in a specified time period (each day in CLEA). (EA, 2002a:127)
Chronic exposure	Long-term exposure to, or contact with, a chemical. (EA, 2002a:127)

Class A liability group:	a liability group consisting of one or more Class A persons. (DETR, 2000a:156)
Class A person:	a person who is an appropriate person by virtue of section 78F(2) (that is, because he has caused or knowingly permitted a pollutant to be in, on or under the land). (DETR, 2000a:156)
Class B liability group:	a liability group consisting of one or more Class B persons. (DETR, 2000a:157)
Class B person:	a person who is an appropriate person by virtue of section 78F(4) or (5) (that is, because he is the owner or occupier of the land in circumstances where no Class A person can be found with respect to a particular remediation action). (DETR, 2000a:157)
Conceptual model	A textual or graphical representation of the relationship(s) between contaminant source(s), pathway(s) and receptor(s) developed on the basis of hazard identification, and refined during subsequent phases of assessment. (EA, 2000:83)
Conceptual exposure model	A textual or graphical representation of the relationship(s) between source(s), pathway(s) and receptor(s) for a site, based on the physical-chemical-biological conditions of the land and climate, and the behaviour of site-users according to generalised land-use. (EA, 2002a:127)
Contaminant:	a substance which is in, on or under the land and which has the potential to cause harm or to cause pollution of controlled waters. (DETR, 2000a:157)
Contaminated land:	defined in section 78A(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." (DETR, 2000a:157)
Controlled waters:	defined in section 78A(9) by reference to Part III (section 104) of the Water Resources Act 1991; this embraces territorial and coastal waters, inland fresh a waters, and ground waters. (DETR, 2000a:157)
Desk study	Interpretation of historical, archival and current information to establish where previous activities were located, and where areas or zones containing distinct and different types of contamination may be expected to occur, and to understand the environmental setting of the site in terms of pathways and receptors. (EA, 2001:121)
Deterministic model	The traditional approach to modelling where in any calculation a single value is assigned to each variable. (EA, 2002a:127)
Durability	The extent to which a remediation treatment is likely to be effective in reducing or controlling unacceptable risks to a defined level over a period of time. (EA, 2001:121)
Effectiveness	The extent to which a remediation treatment successfully reduces or controls unacceptable risks to a defined level. (EA, 2001:121)
Enforcing authority:	defined in section 78A(9) as: (a) in relation to a special site, the Environment Agency; (b) in relation to contaminated land other than a special site, the local authority in whose area the land is situated. (DETR, 2000a:158)
Ex-situ	Where contaminated material is removed from the ground and is either disposed of under controlled conditions (e.g. on site in an encapsulation cell or at an appropriate off-site location) or treated using a process-based system. (EA, 2001:121)

Exposure duration	The specified period of exposure over which the intake rate for a receptor is accumulated (measured in years in CLEA). (EA, 2002a:127)
Exposure frequency	The number of events in a specified time period when a receptor is exposed to a chemical at the intake rate (measured in days per year in CLEA). (EA, 2002a:127)
Generic assessment criteria	Criteria derived and published by an authoritative body which take into account generic assumptions about the characteristics of sources, pathways and receptors, and which are protective in a range of defined conditions. (EA, 2000:83)
Hardship:	a factor underlying any cost recovery decision made by an enforcing authority under section 78P(2). (DETR, 2000a:158)
Harm	Adverse effects on the health of living organisms or other interference with the ecological systems of which they form a part. In the case of humans the definition includes harm to property. (EA, 2000:83)
Hazard	A property (of a substance) or situation with the potential to do harm. (EA, 2000:83)
Hazard assessment	A conceptual stage of risk assessment concerned with assessing the degree of hazard associated with a site or group of sites. (EA, 2000:83)
Hazard identification	A conceptual stage of risk assessment concerned with identifying and characterising the hazards that may be associated with a particular site or group of sites. (EA, 2000:83)
Health Criteria Value	A summary term for benchmark criteria that represent an assessment of levels of exposure that pose a risk to human health, for example, tolerable dally intake (TDI) and Index Dose. (EA, 2002a:128)
Hot spot	A defined area or volume of ground containing elevated concentrations of hazardous substances. (EA, 2000:83)
Index Dose	The dose that can be considered to present a minimal human health risk from exposure to soil contaminants. However, and in addition, efforts are still needed to reduce exposures from all routes to as low as reasonably practicable (ALARP), so that even this minimal risk is further diminished. (EA, 2002a:128)
Intake dose	The amount of a chemical entering or contacting the human body at the point of entry (that is, mouth, nose, or skin) by ingestion, inhalation, or skin contact. Actual intake will be a function of the chemical characteristics and the nature of the target population and their behavioural patterns. (EA, 2002a:128)
Intrusive investigation:	an investigation of land (for example by exploratory excavations) which involves actions going beyond simple visual inspection of the land, limited sampling or assessment of documentary information. (DETR, 2000a:159)
In-situ	where contaminated material is treated without prior excavation (of solids) or extraction (of liquids) from the ground. (EA, 2001:121)
Land affected by contamination	Land which appears to have contamination present but has not yet determined as contaminated land, or is not likely to meet the definition of contaminated land as defined in Part IIA since a complete pollutant linkage is not present. (EA, 2001:121)
Liability group:	the persons who are appropriate persons with respect to a particular significant pollutant linkage. (DETR, 2000a:159)
Monte Carlo method	A computational technique to select a random or pseudo-random value for each probabilistic parameter from a range of specified values. (EA, 2002a:128)

Monitoring action:	a remediation action falling within the definition in section 78A(7)(c), that is "making of subsequent inspections from time to time for the purpose of keeping under review the condition of the land or waters". (DETR, 2000a:159)
Non-threshold contaminant	A substance for which a threshold for adverse health effects cannot be presumed. These substances carry some level of risk at any given level of exposure, although the risk may be minimal at low levels of exposure. (EA, 2002a:128)
Orphan linkage:	a significant pollutant linkage for which no appropriate person can be found, or where those who would otherwise be liable are exempted by one of the relevant statutory provisions. (DETR, 2000a:159)
Owner:	defined in section 78A(9) as: re "a person (other than a mortgagee not in possession) who, whether in his own right or I as trustee for any other person, is entitled to receive the rack rent of the land, or where 95 the land is not let at a rack rent, would be so entitled if it were so let." (DETR, 2000a:159)
Pathway	A route or means through which a receptor could be exposed to, or affected by a contaminant. (EA, 2001:121)
Pollutant linkage	The relationship between a contaminant (source), a pathway and a receptor (EA, 2000:83)
Practicability	The extent to which it is possible to install and operate a remediation option or strategy given practical constraints such as site size, access, availability of support services etc. (EA, 2001:121)
Preliminary risk assessment	This stage aims to determine whether there are any potentially unacceptable risks associated with an area of land. (EA, 2001:121)
Probabilistic model	An alternative to deterministic modelling where some single-value parameters are replaced with a family of values selected from a defined probability distribution. (EA, 2002a:128)
Pollution of controlled waters:	defined in section *78A(9)* as: "the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter." (DETR, 2000a:160)
Possibility of significant harm:	a measure of the probability, or frequency, of the occurrence of circumstances which would lead to significant harm being caused. (DETR, 2000a:160)
Receptor	A living organism, a group of organisms, an ecological system or a piece of property that could be or is being adversely affected by a contaminant. (EA, 2001:)
Register:	the public register maintained by the enforcing authority under section 78R of particulars relating to contaminated land. (DETR, 2000a:160)
Remedial action	Action taken to mitigate or reduce defined unacceptable risks. Remedial treatment and remedial works are specific examples of remedial action. (EA, 2000:83)
Remediation:	defined in section 78A(7) as "(a) the doing of anything for the purpose of assessing the condition of - "(i) the contaminated land in question; "(ii) any controlled waters affected by that land; or "(iii) any land adjoining or adjacent to that land; "(b) the doing of any works, the carrying out of any operations or the taking of any steps in relation to any such land or waters for the purpose -)5 "(i) of preventing or minimising, or remedying or mitigating the effects of any) significant harm, or any pollution of controlled waters, by reason of which the contaminated land is such land; or d) "(ii) of restoring the land or waters to their former state; or f,

	"(c) the making of subsequent inspections from time to time for the purpose of keeping under review the condition of the land or waters." (DETR, 2000a:161)
Remediation criteria	Provide a measure (usually quantitative} against which compliance with the remediation objective will be assessed. (EA, 2001:121)
Remediation declaration:	defined in section 78H(6).It. is a document prepared and published I a by the enforcing authority recording remediation actions which it would have specified fig in a remediation notice, but which it is precluded from specifying by virtue of sections 78E(4) or (5), the reasons why it would have specified those actions and the grounds on which it is satisfied that it is precluded from specifying them in a notice. (DETR, 2000a:161)
Remediation notice:	defined in section 78E(1) as a notice specifying what an appropriate re. person is to do by way of remediation and the periods within which he is required to do each of the things so specified. (DETR, 2000a:161)
Remediation objective	A site specific objective relating solely to the reduction or control of the risks associated with one or more pollutant linkages. (EA, 2001:121)
Remediation option	One or more remediation treatments which will reduce or control the risks associated with a particular pollutant linkage to a defined level. (EA, 2001:121)
Remediation package:	the full set or sequence of remediation actions, within a remediation 'or scheme, which are referable to a particular significant pollutant linkage. (DETR, 2000a:161)
Remediation scheme:	the complete set or sequence of remediation actions (referable to one or more significant pollutant linkages) to be carried out with respect to the relevant land or waters. (DETR, 2000a:161)
Remediation statement:	defined in section 78H(7). It is a statement prepared and published by the responsible person detailing the remediation actions which are being, have been, or are expected to be, done as well as the periods within which these things are being done. (DETR, 2000a:161)
Remediation strategy	One or more remediation options that have been integrated into a site plan for managing the identified risks on site (EA, 2001:121)
Risk	A combination of the probability, or frequency of occurrence of a defined hazard and the magnitude of the consequences of the occurrence (EA, 2001:121)
Risk assessment	The formal process of identifying, assessing and evaluating the health and environmental risks that may be associated with the hazard. (EA, 2001:121)
Risk estimation	A conceptual stage of risk assessment concerned with estimating the likelihood that an adverse effect will result from exposure (of the receptor) to the hazardous substance or agent. (EA, 2000:84)
Risk evaluation	A conceptual stage of risk assessment concerned with evaluating the acceptability of estimated risks, taking into account the nature and scale of risk estimates, any uncertainties associated with the assessment and the broad costs and benefits of taking action to mitigate the risks. (EA, 2000:84)
Risk management	The process whereby decisions are made to accept a known or assessed risk and/or the implementation of action to reduce the consequences or probabilities of occurrence. (EA, 2000:84)
Significant harm:	defined in section 78A(5). It means any harm which is determined to be significant in accordance with the statutory guidance in Chapter A (that is, it meets one of the descriptions of types of harm in the second column of Table A of that Chapter). (DETR, 2000a:162)
Significant pollutant:	a pollutant which forms part of a significant pollutant linkage. (DETR, 2000a:162)

Significant pollutant linkage:	a pollutant linkage which forms the basis for a determination that a piece of land is contaminated land. (DETR, 2000a:162)
Significant possibility of significant harm:	a possibility of significant harm being caused which, by virtue of section 78A(5), is determined to be significant in accordance with the statutory guidance in Chapter A. (DETR, 2000a:162)
Site reconnaissance	A walk over survey of the site. (EA, 2001:121)
Site-specific assessment criteria	Criteria derived by an assessor in the context of an individual site or situation, which take into account the specific characteristics of contaminants, pathways and receptors. (EA, 2000:84)
Source	A hazardous substance or agent (for example a contaminant) which is capable of causing harm. (EA, 2000:84)
Special site:	defined by section 78A(3) as: "any contaminated land - "(a) which has been designated as such a site by virtue of section 78C(7) or "(b) whose designation as such has not been terminated by the appropriate Agency under section *78Q(4)...".* (DETR, 2000a:162)
Specific criteria	Measures (often expressed in terms of an acceptable dose or concentration of a contaminant in a particular medium} that can be used in conjunction with a suitable exposure or fate and transport model to estimate the risks associated with a particular site and set of circumstances. (EA, 2001:121)
Stakeholder	A person or organisation with an interest in the scope, conduct and outcome of a risk management project (EA, 2001:121)
Substance:	defined in section 78A(9) as: "any natural or artificial substance, whether in solid or liquid form or in the *form of a gas or vapour.*" (DETR, 2000a:162)
Supplementary investigation	Investigation carried out subsequent to a detailed investigation for the purpose of refining risk estimates, to assist in the selection of an appropriate remedial strategy, or for detailed (remedial) design purposes. (EA, 2000:84)
Target dose	The amount of a chemical that reaches a target organ in the body. (EA, 2002a:128)
Threshold contaminant	A chemical for which it is assumed that there is a threshold level of toxicant that needs to be present to produce an effect (for example, inhibition of an enzyme) leading to the adverse effects on health. (EA, 2002a:128)
Tolerable daily intake	An estimate of the amount of contaminant, expressed on a body weight basis, that can be ingested daily over a lifetime without appreciable health risks. (EA, 2002a:128)
Unacceptable risk	A human health or environmental risk that exceeds an appropriate measure published by an authoritative body of what is judged to be acceptable for the application [scenario] under consideration (EA, 2001:121)
Uncertainty	A lack of knowledge about specific factors in a risk or exposure assessment including parameter uncertainty, model uncertainty and scenario uncertainty. (EA, 2002a:129)
Uptake dose	The amount of a contaminant that reaches the circulating blood having been absorbed by the body through the skin, the gastrointestinal system and the pulmonary system. (EA, 2002a:129)
Variability	A type of uncertainty, referring to natural or inherent differences in a sample population. For example, the changing soil concentration across a site or the heights of people of the same age in the UK. (EA, 2002a:129)
Verification of remediation	The process of demonstrating, by means of inspection, sampling, testing and recording, that the remediation meets the site specific remedial objectives (EA, 2001:121)

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APPENDICES

Appendix One

Copy of Focus Group Interview Questions

(December 1998)

Discussion Topics

1. **S.57 of the Environment Act requires local authorities to inspect their areas for the purpose of identifying contaminated land in its area. There is now some funding which has been made available by DETR to undertake this statutory obligation. Nevertheless there are several practical implications for local authorities. The draft guidance (and the revised draft guidance) requires local authorities to prepare and implement a strategy within 15 months of the guidance coming into force. The first stage seems to be identifying which local authority officers will be responsible for identifying potentially contaminated sites?**

I. Do you see it as a primarily Planning or Environmental Health role?
II. Who will carry out what duties?
III. What information is available?
IV. Is the information accessible and easy to interpret?
V. How will information be stored and who will have access to it?

2. **Having identified and collated existing information what processes can be used to determine the possibility of a site causing significant harm?**

I. What information is deemed sufficient to make contact with the site owner/ undertake intrusive investigations?
II. What risk assessment procedures are being looked at?
III. How will potential targets be identified?

3. **In certain circumstances contamination of ground water may be an issue for local authorities. In such circumstances how will local authorities interact with the Environment Agency?**

I. What information will the Environment Agency give?
II. How will that information be used by local authorities?
III. Will information from the Environment Agency be relied upon if a consultants report suggests that there is no contamination?
IV. What is the legal status of Environment Agency Information?

Discussion Topics

4. **It is the governments intention that contaminated land is brought back into beneficial use through the development system (Framework for Contaminated Land, 1995). This has implications both in terms of Planning Control and S.57. Where a planning application is received adjacent to a former gas works site and there is significant pressure for the housing development how do local authorities proceed? On the one hand there is political pressure to see housing developed, on the other hand by allowing the development to go ahead are you creating the possibility that the former gas works site could cause significant harm?**

I. How will information from third parties (developers, consultants) be used?
II. How will its quality be assessed?
III. How will developments be regulated - will consultants information be relied upon?
IV. If not what are the alternatives?
V. Is the legislation likely to favour developers?

5. **Have any authorities looked at the cost of producing and implementing a strategy?**

- Who?
- How much?
- Who responsible for what?
- What timescales?
- What methodology have you used to determine whether a site presents a significant risk of being contaminated?
- How much land in your area would you estimate may be contaminated within the legal definition?

Appendix Two

Copy of Focus Group Questionnaire

January 1999

Contaminated Land - Initial Questionnaire

Information about yourself:

Name:

Organisation:

Address:

Telephone No: Fax No:

Years of total experience relating to contaminated land regulation/enforcement:

What are your main job functions and responsibilities?

Please turn over the page.
Initial Questionnaire (Page 2)

Please identify the most important issues and concerns relating to the regulation of contaminated land. 20 spaces are provided for your use, but you may identify less than 20 if you wish.

Please rank order your responses from 1 to 20 with 1 being the highest

1	11
2	12
3	13
4	14
5	15
6	16
7	17
8	18
9	19
10	20

Name:_____

Appendix Three

Copy of Questionnaire

(July 1999)

CONTAMINATED LAND QUESTIONNAIRE

1. Which departments have a role in regulating potentially contaminated land in your local authority?

Department	Tick (where appropriate)	Responsibilities	Contact name	Telephone No
Environmental Health				
Planning				
Estates				
Engineering				
Building Control				
Other (please specify)				

2. Which department(s) will be responsible for creating and implementing your local authority's strategy to implement S.57 and what will be their role(s)? (See Definitions Sheet)

Department	Tick (where appropriate)	Role
Environmental Health		
Planning		
Estates		
Engineering		
Building Control		
Other (please specify)		

3. Has your local authority undertaken any preparatory work in preparation for S.57?

Yes☐ No☐

If yes please give brief details

Peter Knight. *CRESR*, Sheffield Hallam University, Pond Street, Sheffield. S1 1WB

4. What information will be used in order to assess a site's potential to be contaminated?

Information Source	Tick if appropriate
Current and preceding OS Maps	
Planning Files	
Draft S.143 data	
Existing site investigation reports	
Registers of Prescribed Processes	
Others (please specify)	

5a. Will this information be stored using a GIS system? Yes☐ No☐

5b. If No how does your local authority intend to store information?

6 Which of the following previous uses would your local authority classify as having the greatest potential to cause 'significant harm'?. Please rank each previous use on a scale of 1 to 5. Where 1 is considered to pose the most significant risk and 5 the least significant risk.

Previous Use	Level of risk	Previous Use	Level of risk
Tar and bitumen works		Radioactive material processing	
Metal smelting and refining		Dock yards and wharves	
Waste disposal sites,		Electrical and electronics manufacturing	
Electricity Generating (excluding nuclear power stations)		Garages (petrol and car repair)	
Fertiliser manufacture		Film and photographic processing	
Transport depots,		Engineering (heavy and general)	
Iron and steel works		Animal slaughtering and by-products	
Pharmaceutical industries		Oil refining and petrochemicals production	
Asbestos manufacture and use		Gas works	
Laundries and dry-cleaning (large scale)		Railway land	
Food processing, including brewing and malting.		Plastic products manufacture	
Paper and printing works		Explosives industries	
Concrete and ceramic works		Organic and inorganic chemical production	
Scrap yards		Sewage treatment works	
Fine chemical and dye stuff manufacture		Textiles manufacture	

7. Are the previous use(s) which you have classified as having the greatest potential to cause significant harm those which your local authority is most likely to require a site investigation?

Yes☐ No☐

If No why not?

7a. Are there any other previous uses not mentioned in Question 6 which are of particular importance in your area?

Yes☐ No☐

If Yes please specify.

8. Will the information that is presently available to your local authority be sufficient to enable a decision to be made relating to the sites potential to be contaminated?

Yes☐ No☐

9. What confidence level would your local authority require before requiring a site investigation?

<50%	50-75%	76-90%	90-95%	95-99%	99%>

10. How many sites in your local authority area would you estimate to be contaminated within the legal definition?

0	1-2	2-5	5-8	8-10	10>

11. At the present time do you feel that your local authority will ever take any regulatory action against a landowner/polluter based on the initial desk top study which will be undertaken to inspect your area for the purpose of identifying contaminated land?

Yes☐ No☐

12. Do you expect that the CLEA (Contaminated Land Exposure Assessment) model and accompanying guidance will assist your authority in identifying contaminated land?

Yes☐ No☐

13. What additional resources, if any, will your local authority require in order to implement S.57?

14. Has your local authority identified a cost to implement the provisions of S.57?

Yes☐ No☐

If yes what will be the likely cost to your local authority?

Peter Knight. Gibson, Sheffield Hallam University, Pond Street, Sheffield. S1 1WB

15.. Will S:57 enable local authorities to effectively identify contaminated land with its area?

Yes☐ No☐

Please give reasons for your answer

16. There have been a number cases where similar developments on previously used sites have been dealt with very differently in terms of contamination by different local authorities during the planning process. Do you agree that the introduction of a new risk based framework in the form of S.57 will increase consistency among local authorities?

Yes☐ No☐

17. This research will present various case studies showing how risk assessment works in practice. These case studies will identify the benefits and difficulties of using such a process in the regulation of contaminated land. Does your local authority have any specific examples where the use of risk assessment techniques has lead to difficulties in regulating development or has developed a risk assessment technique for the purpose of identifying contaminated land under S.57?

Yes☐ No☐

If Yes please provide brief details.

Thank you for your time completing this questionnaire. Should you require any further information about my research please contact me on 0114 225 3562.

Any information which is supplied in this questionnaire will remain confidential. Information identifying individual respondents or local authorities will not be disclosed as part of this research.

Your Name:
Department:
Contact Number:

Peter Knight. *CRESR*, Sheffield Hallam University, Pond Street, Sheffield. S1 1WB

Appendix Four

Copy of Cleveland Questionnaires

(August 1999)

Cleveland Questionnaires

Interview/Discussion Fact Finding Questions with Dr Robert Simons , Levin Institute Cleveland University, Ohio

1. How are sites identified
2. What about incomplete information
3. How is information stored
4. Does the listing of sites lead to blight
5. How are sites identified in terms of risk
6. What are the drivers/tools in promoting the brownfields programme
7. What is the demand for brownfields?
8. What is the incentive for the state to provide finance for reclaiming brownfield land when the cost of developing 'virgin' land is cheaper
9. If the market values are better in the suburbs – is there no planning legislation available to create boundaries around cities pushing developers back into the suburbs?
10. Where is information stored about listed and unlisted sites?
11. How were underground storage tanks mapped?
12. What information sources were used?
13. How is their leaking potential identified?
14. Is the Ohio Brownfield Programme restricted to certain parts of the State?
15. What sorts of sites will be placed on the Superfund NPL list?
16. Are CERCLIS sites physically investigated – if so how is this funded?
17. Are there any brownfields that are more likely to receive capital incentives?
18. The available lists seem to relate to the current or last know use – is there any information about more historic uses of the land?
19. Has Ohio moved away from the joint, strict and several liability clause?
20. Are there separate definitions of brownfields for sites which would be dealt with through CERCLA?
21. Is there a system of zoning in terms of what will be 'allowed' in a certain location?
22. EPA keeps a list of 'known' contaminated properties how do they know? Are they surveyed and if so who provides the capital – where does that capital come from?
23. Once a site has been cleaned up is any information relating to that site kept on a register?
24. To what standard are sites required to be cleaned (if no zoning)?
25. Are taxes raised locally by the State to encourage development?
26. How do the brownfield programmes work
27. Where are they
28. What are they
29. How are they funded and regulated?

Telephone Interview Questionnaire

Bob Myers, Federal EPA.

1. What is the role of the Federal EPA in Regulating Brownfield sites
2. How do you collate information relating to brownfields/superfund sites?
3. How do you assess consistency between State EPAs
4. What sort of interation is there between the Federal EPA, the Regional EPA and State EPA
5. Is the Regional EPAs role related just to superfund sites or do you also get involved with Voluntary action programmes?
6. Do you encourage any pro-active identification of potential superfund sites or do you respond to specific complaints or problems?
7. What methodology is employed to determine whether a site is a superfund site or a NFA site?

Interview Questionnaire

Greg Myers Cleveland Economic Development Office

1. Define your role/area within the brownfields programme
2. What criteria do the developers need to meet in order to obtain finance
3. Are there any priority areas where funds are targeted more than others
4. Are there any sites due to the presence of contamination that you would not give funds to – i.e the rusk of failure is too great?
5. How many developers have benefited from receiving funds
6. What is the usual timescale for receiving funds.? Do they receive this funding at the beginning or end of the scheme. Do the timescales effect the developers plans
7. How successful do you feel the public/private finance initiative has been.
8. Do you believe that this system is having a positive impact on the brownfields programme?
9. How do you obtain your funds?
10. Do you work in conjuction with other funding agencies in providing funds for brownfield projects?
11. How do you evaluate the success of a project
12. Is your system similar to that in other Counties or States or would you say that your programme is unique?

Interview with Virginia Aveni and Daniel Meaney.
Cuyahoga County, Ohio, County Planning Commission

1. Define your role/area within the brownfields programme
2. What criteria do the developers need to meet in order to obtain finance
3. Are there any priority areas where funds are targeted more than others
4. Are there any sites due to the presence of contamination that you would not give funds to – i.e the risk of failure is too great?
5. How many developers have benefited from receiving funds
6. What is the usual timescale for receiving funds.? Do they receive this funding at the beginning or end of the scheme. Do the timescales effect the developers plans
7. How successful do you feel the public/private finance initiative has been.
8. Do you believe that this system is having a positive impact on the brownfields programme?
9. How do you obtain your funds?
10. Do you work in conjuction with other funding agencies in providing funds for brownfield projects?
11. How do you evaluate the success of a project
12. Is your system similar to that in other Counties or States or would you say that your programme is unique?

Interview with Jennifer Kwasnewski, Ohio EPA

1. What is your role within Ohio EPA
2. What is OEPAs role within the brownfields programme
3. Do you get involved at all with Superfund sites?
4. Who would be the best person to speak to regarding CERCLIS sites at State level
5. How does the funding system work in relation to the voluntary action programme?
6. I have heard that OEPA is fairly unique – in what ways?
7. Would you say that the VAP programme has been successful – if so in what ways?
8. Do you have any specific examples of successful VAPs.
9. Have you encountered any problems with the VAP programme?
10. How do you satisfy yourselves that remediation has been undertaken satisfactorily?
11. Are the consultants that issue the NFA letters appointed by you or is it up to the developer to choose/
12. What factors do you consider when accepting a developer on the VAP
13. Do you think the VAP could be improved and if so in what ways?
14. What clean-up standards do you use to determine potential health risks?
15. There appears to be a lot of information on the internet relating to brownfields. How has this information been collated. Is it based entirely on current use. Are Sandbourne maps used?
16. Are any CERCLIS sites investigated here at State level?
17. Is the evaluation of risk developer funded or State funded?

Appendix Five

Copy of Letter From DEFRA in Relation to a Request to View Consultation Responses

DETR
ENVIRONMENT
TRANSPORT
REGIONS

TREVOR JONES
POLICY ASSISTANT
CLL1 CONTACT.

DEPARTMENT OF THE ENVIRONMENT
TRANSPORT AND THE REGIONS
ZONE 3/B3
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123 VICTORIA STREET
LONDON SW1E 6DE

DIRECT LINE: 020 7944 5297
DIVISIONAL ENQUIRIES: 020 7944 5287
FAX: 020 7944 5279
GTN CODE: 3533
e-mail: trevor_jones@detr.gsi.gov.uk

OUR REF: CLL 30/2/3

31 MARCH 2000

Peter
Mr P Knight BSc (Hons)
Centre for Regional Economic & Social Research
Sheffield Hallam University
City Campus
Howard Street
Sheffield S1 1WB

Dear Mr Knight

PARTIIA IMPLEMENTATION RESEARCH

Thank you for your letter of 29 March to Malcolm Lowe asking about the responses to our consultations on the Part IIA Statutory Guidance.

I am not sure which set of responses you wish to see. Those to the October 1999 consultation are currently in our library at the above address, not in the House of Common library. If you wish to see the responses to the earlier consultations exercise in 1996 these can also be place in our library.

If you wish to visit the library to see the 1999 responses I would ask that you contact them on Tel: 020 7944 3039 so that they can be made ready for you. If you wish to see the earlier 1996 responses please let me know when you intend to visit and I will arrange for them to be placed in our library as well.

You also mentioned that you would like to discuss how, in general terms, this information was used. Malcolm Lowe would be pleased to see you. He can be contacted on Tel: 020 7944 5294 to arrange a suitable time.

Yours sincerely

Coming on May 8+9
Wants to see responses to
Paying for Our Costs ✓
Sept 96 ✓
Nov 96 ✓
Oct 99-

TREVOR JONES

INVESTOR IN PEOPLE

are you doing your bit?

Pt2a-P-Knight

Appendix Six

Copy of Interview Transcript with Malcolm Lowe

(June 2000)

At the time of the interview Malcolm Lowe was Head of the Land and Liability Department, DETR and was responsible for drafting a considerable amount of the policy and guidance relating to Part IIA

Interview Transcript

Malcolm Lowe

June 12th 2000 at DETR, London

1. Firstly if you could just tell me a bit about your background and your involvement in the creation of this policy.

Well I'm just a generic civil servant on the normal sort of postings system and I got a job working on this team - but that is just happenstance. The point at which I joined the team it was headed up by a professional environmental engineer with a personal background in the subject area. At that point the team was very much a policy team than a technical policy team so that expertise helped in developing policy.

2. In your own words then could you provide a potted history of contaminated land policy as it stands at the moment.

There is a continuity stretching back in effect to the 1960's. Many of the chunks of policy related to the geotechnical hazards on derelict sites, with a desire to reclaim derelict land. Things such as the Aberfan (Sp) disaster in 1963 gave it a kick start - well look we've got all this trashed land - we've got to do something about it. And so lots of spoil heap reclamation, stability works etc. put in place. Then an increasing desire to recycle land - emerging through the 1970's a thought that - hey look guys - some of this land is contaminated and so by 1976 the Interdepartmental committee on the Redevelopment of Contaminated Land was formally established and the first circular about it was in 1977. That continued with various different emphasis - but primarily the policy relating to contamination was relating to the redevelopment of the land. Through the second half of the 1980's that started to come under some pressure and an increasing consciousness grew of the potential health implications of existing use in regards to contamination - the Loscoe landfill gas explosion for example came on top of a variety of different moves that were saying the same sort of thing.

In 1990 there was a Select Committee report which actually said that just focusing on redevelopment isn't enough we have got to do more - just relying on the redevelopment programme to sort out all the sites isn't going to work. If you're going to have a development there - how long are you going to wait sort of thing? Now at the same point there were a number of 'gosh, shock, horror' type TV programmes 'Valleys of the Damned' and so on and nice sunset shots with oil drums and those sorts of things, and the clamour rose saying we don't even know where all these sites are. So simultaneous with 'we have got to do more about these sites more generally' there was a 'I don't really know where they are move wouldn't it be a good idea if we had a public register of all of these recording historic land uses. So late stage of the passage of the Environmental Protection Act the S.143 registers proposal was inserted in the Bill. The other emerging historical trend at that point - well there were two other significant ones. One was that the United States was really letting rip on the Superfund and it was doing all sorts of interesting damage to the UK insurance

industry in particular with Lloyds and also not long thereafter the property market started going into a cyclical slump. So what effectively happened was that the property market ended up in a situation - to their way of thinking had suddenly invented a whole new problem called contaminated land to put some sort of perspective on that - quite the importance of the issue that the property market may or may not have had - to have invented this sort of problem - they could look across to the United States and say Urghh some sites cost a fortune.

Somebody was threatening to produce a list of sites that may or may not be a problem and so we end up with a variance of the logic that pillar boxes are communist on the basis that they are red. Contaminated land might cost a fortune - here is a list of things that might be contaminated *ergo* this is a list of sites that is going to cost a fortune. Seriously screwed logic. What emerged from the fall out of all that was. Yes information about potentially hazardous sites might be is a technical starting point and maybe having it collected in one central place is going to be a whole lot cheaper - a whole lot more efficient a whole lot more authoritative than having a whole lot of private sector information vendors pumping scare stories on web-sites.

The problem came in that the market didn't know how to respond to that sort of information. In particular what became clear was that the pattern of potential liabilities and responsibilities weren't securely based - weren't securely bedded down enough. The emerging policy through the 1970's and 1980's had been the 'suitable for use framework' had been 'risk based' - before we knew the words 'risk based' really. So those were all in place - but there was a different model in the United States - there was a different model in the Netherlands. The European Union was already starting to warm up on the liability issues. The liability in the States basically made everybody's aunty liable for everything else. It is easy to character (Sp) but it doesn't travel well as a bit of news. So in a way there was a genuine factor that the market was responding to the possibility of information - I can't process this - it could be bad news so that I will just have to assume the worst. So as part of the exit strategy from the S.143 registers proposal in 1993, the government announced a review of policy, looking particularly at the issue of liabilities - so there is the 'what might somebody might be liable for' - but then there is the question of 'who should actually pay'. What is the framework - how does it relate to anything else and how can it be defined. so the consultation paper published in 1993 *Paying for our Past* - its processed in that way.

Now the out come from that process reported in 1994 in *Framework for contaminated land* - said that broadly speaking the existing system of rules is OK - but nobody knows what they mean - so regulators can't use them effectively - because they are not very good regulatory tools as they are all a bit vague - so we can't really say that were are providing an appropriate level of public health protection and protection of the environment. But also the people who might be regulated don't know that somebody isn't going to go off on a jolly an actually make them liable for something. But also it didn't look credible as a liability regime for contaminated land anymore it was too vague - it looked like something that needed to be reviewed so it was a case of lets get it over with and lets do it - so the objective for the 1995 provisions was to recodify - in long detail- what the rules are, when they will be used, and who will be there to pay for them. It was almost an academic exercise in proving a point rather than -

there was a phrase around at the time 'there is no evidence of a need for some new crusade to deal with contaminated land. It wasn't a 'we all need to panic and lose our heads about this.

It was an exercise in lets just write down the rules that would apply - if there were a problem site. Maybe the perspectives of really needing to get to grips with the issue has sort of emerged more - a brighter light has been shone on the issue of contamination and so generally the perspective that there is a probably a greater deal of need for regulatory intervention is perhaps emerging. In terms of a complete pecking order of threats to human health you do get some very peculiar, odd and nasty site, but overall you would probably say that improving urban air quality is a bigger priority for public health protection. But having said that - obviously one of the key drivers for the liability regime was to clarify the rules that would apply if it all went horribly wrong so that people could then develop a new site because they new what the rules would be and they would have a target to miss, and that was always a key component of devising the new regime, was to define the rules for other circumstances. So although the new regime isn't about promoting development directly, it is there to underpin it, it is to provide something of a comfort blanket both on the technical approach as to when a liability be created but also then who could then have it. Now it is in that context of providing that clarity that certainty that we end up going down the tract of having probably the worlds most detailed liability regime.

3. There were quite a lot of consultations leading up to the production of the statutory guidance. I came down a few weeks ago and briefly examined some of them. There is a huge number of them from a whole range of different interest groups - how did you actually go about weeding them out and saying well we'll ignore that one - we think that is a good idea etc.

Well nothing gets ignored. Everything gets read, but everything gets evaluated. One of the things that a government team working on something like this has to do, is to get above the individual details, and get above the reasons why anybody might be making a particular point and to see where somebody else might be saying the exact opposite and in effect you arbitrate between to produce the balanced fit picture. That also applies because coming from a small number of people who are focusing on a small number of issues from an overall package and potentially they start cherry picking things that they have seen from somewhere else. What they don't see is.... its not a criticism it's just an observation...they don't see how that will fit into the overall framework. So for example, you end up in the United States, with some very detailed rules bolted on the end of things that secure lender exemptions - but that is exempting lenders from liabilities that they wouldn't have in the first place. So somebody saying that we need a secured lender exemption is for essentially an entirely different liability so it would mean something different and the type of protection that they actually get in the States is provided by a line in the Statutory Guidance anyway, you don't need anything more.

Some comments are 'you would say that any way' or 'nice try'. But other times there is a very particular point that comes from a very particular place that they are making a very valid point that 'hey you are totally screwing my business process here to no great benefit' so some very late changes were made to a

particular exclusion test that relates to consultants and contractors - because of very fine details of the wording it was potentially leaving them open to liabilities that they should not have in the first place, and a change was made to deal with that. In terms where we got the consultation lists from - it was really a mixture of organisations that we could see really that would have an interest and that we would definitely wish to involve in the process and people insisted that they had an interest in the process and a demand to be spoken to. So it was largely an add only process of drawing up the list over the progressive stages of consultation. So on the consultation of *Paying for our Past* it was a big stormy issue, a lot of involvement from the property industry professions, and trade bodies in particular [telephone interruption].

Talking development consultation lists. *Paying for our Past* a lot of people - it was a big stormy issue at the time, a lot of people wrote in - it may have been more - piles of different trade bodies, local groups local councils whatever. So when we moved to consultation on the guidance - well there was a sort of phased approach. The very first things that were produced were the sort of things called working drafts, so we didn't hugely pro-actively send them out to anybody, except that we developed a sort of network of technical and professional and trade interests, who we knew that would be able to comment on the level of technical detail and legal detail of the people we are talking to. We probably ended up with about 30 or 40 different organisations.

Institution of Civil Engineers, RICS, Bankers, Insurers, CBI a variety of sort of people of that kind, who we knew we wanted their technical input. So in about Easter of 1995 a working draft was produced of some of the technical bits of guidance particularly on the definition of contaminated land and inspection - now that was available to anybody who knew it existed and asked for a copy,. but it wasn't necessarily positively pointed out. Then through the summer of 1996 there were then 2 rounds of working draft on a fuller package - restructured somewhat but building on the 1995 text - and then in autumn 1996 we then moved on to first consultation on a full draft. At which point we went back to the original consultation list and thought which of these do we really definitely need to speak to. We sent out several hundred copies - but in some cases we may have written a letter saying that it is around, because sometimes when you send it to small trade bodies they have moved on anyway - you're writing to the Honouree Secretary at such and such an address and the company that you work for has now moved.

That consultation exercise then produces another n hundred all of which were read through and read through across the team, and we pick up every point that - well - you get a lot that say 'this is going to require an awful lot of resources' or ' its really important that you do make this a local authority responsibility' or ' its very important that you don't'. People trying to say something in the primary legislation is unfair - well that's all jolly interesting. In the light of that consultation exercise we then concluded that the changes that we made in the guidance were such that we would have to consult again and so that - there was a sort of time out delay while we changed the government- but the next draft went out on a limited circulation in 1998 - or am I talking nonsense - I forget the various rounds of consultation now.

We did do one round of consultation that was described as discussion draft, and we were illustrating potential changes to the text - and that primarily went out to the narrow group - the 40 or so bodies, but that was then backed up by the next full consultation round, which actually did make quite a lot of change to the structure of the text, but there again it was building on the consultation lists so it always difficult not to consult again if you have previously consulted of them. The legal test is that the Secretary of State consults - in this case the Environment Agency and such other persons he considers appropriate to consult. So the lawyers advice is that if you have consulted them once, why are they no longer appropriate to consult. But anybody else who writes in you can get a copy. People volunteer opinions whether you specifically ask them or not. Somebody who has produced a detailed response tends to get a copy of the next round - partly out of courtesy, but also they are part of the debate.

4. What would you say were the main sorts of issues coming out of the consultations?

Difficult to kind of specify - because in a wacky kind of way the whole thing emerged from consultations of one kind or another, but there is a core of the test of what the regime as a whole is trying to do and the approach to liability that was sort of there before anybody was spoken to. The whole thrust has emerged with a long period with industry with business, with local authorities, whatever, stretching back to 1992/3 and keeping on going. So by the time that you reach formal consultation on statutory guidance it is already being shaped a lot by the types of things that would have come in through consultation responses if it hadn't been shaped that way. If that isn't an odd logic.

It was already meeting many of the points that they would have made. So the things that were actually discussed in consultation frequently ended up being quite micro points. In terms of the..apart from looking at the overall presentation of the materials and the structure and the clarity and the way that it is put together as a package. There was a bundle of issues around the definition of contaminated land ' what actually are we going to say is a 'significant possibility of significant harm?'. Quite a lot of changes made but more on the presentation side on the inspection strategy stuff and then the liability components - a lot of discussion on - what the reasonable requirements within the various different exclusion tests or the way it is presented. a lot of it looking as though it is discussing fine points of detail and it probably was but in a context that was designed to meet things that were being said in Parliament during the passage of the legislation. For example of landowners being able to pass on liability when they sell the land - gets built in, in a specific way into the statutory guidance - and then you have a discussion on the fine print of the way that works and where it happens and where it doesn't. The real substantive issue - the consultations are in the margins of the parliamentary debate in a way rather than in the later consultation.

5. The legislation itself is likely to be a huge cost burden for local authorities and the Environment Agency - I wonder was there any cost benefit analysis undertaken. And is there a published breakdown of these costs?

Right there is a sort of developing history on this. Or the history developed as it went rather than developing history subsequently. When the Bill was introduced any new legislation comes with a financial memorandum which is presented to parliament. At that point it says at that point there weren't any cost implications because all we were doing at the time were recodifying existing responsibilities and existing duties which in a legal nit picking sense is actually true. The problem is that when you actually start shining a light on something - it looks more of a duty than it did before and by the time you start introducing ideas for positive strategies for inspecting areas rather than just a duty to cause to inspect from time to time.

The primary duty is actual the same but we have actually beefed it up by putting some statutory guidance on it. One of the first key decisions that was taken before we had the change of government in 1997 was to actually say well look we actually need to resource this some more because to can make the case that local authorities aren't doing enough, and requiring them to do what they should be doing properly actually requires more money than they are currently deploying, so that got feed into the wish list in the Comprehensive Spending Review in 1998. well the basis of the numbers here - it was to a large extent a wet finger in the wind exercise and the key component was a statement by the then Association of District Councils which said that it would require on average say 1.5 people full time equivalent per authority to take on this responsibility. Well you can cost up 1.5 people and you end up with around £12M a year. that was the number for better or worse that got fed into that component of the spending review. We also looked at what other types of expenditure might be needed. That £12M was related specifically to the revenue costs of employing officers to do this. You have then got site specific inspection costs and orphan liability clean-up.

We have already got the supplementary credit approval programme and that was augmented to some extent - to pick up some extra demand - but it has always been recognised that probably over a period of time, there will be increasing demand on that expenditure line to deal with the site specific elements of costs - but it is impossible to predict in abstract what those might be. How many sites are there what is the remediation going to cost, are we really going to find that we can't make people liable or are we picking it up as a public responsibility under hardship. There are too many variables and uncertainties to actually produce something...its not worth trying to get clever numbers on it as you are just going to get spurious accuracy. What we have got built into the regime is a reporting mechanism through the Environment Agency Nation Report plus we receive the bids for funding support in - so we can know what the demand is looking like in terms of the funding - so that can get fed in in terms of future expenditure rounds. But one of the key lessons we have learnt in this area is that there is no point just dumping money in early.

If you look at the process that a local authority would go before it really started spending any serious money on any individual site - it has had a general think about its area and found some specific areas to look at and investigated those and found that it is contaminated - it has though about how it might approach remediation, who it might get to pay it's designing up a solution and then it starts a 2 or 3 year programme on site to clean it up. Putting money in on year one - you're just going to be getting it back because you can't actually spend it

on projects on site. But you are almost saying the time horizon for which you can predict demand might materialise is actually longer than the actual time horizon than the financial planning horizon in central government - we plan 3 years ahead. From a standing start on contaminated land you are not really spending any significant amount of money on it in three years. It is a doctor of engineering type of exercise (??) you know it just can't be done. We anticipate that this is something that will have to be kept under review.

6. Was there any point through out this whole process when it looked as though the costs would outweigh any benefits and that the implementation of Part IIA might be abandoned?

Well that was implicit in the Comprehensive spending review. The announcement made by Michael Meacher in December 1997 was that there were going to be cost implications. we can't implement this unless we get any money and so if the Comprehensive spending review had come along and said well look you can't have any money, well we wouldn't have implemented the legislation. just adding on to that there is also. The whole regime also at various stages went through a more formal compliance cost assessment process - a regulatory impact assessment process. That any new regulatory process has to go through. They tend to look more at costs and benefits in terms of external costs, say the external costs of business of complying - is it worth the effort - we've published/costed up our assessments and regulatory impact assessments as we have gone.

7. Do you think that by adding the pro-active duty to inspect areas for identifying land it has made it more difficult to implement this legislation - in hindsight would it not have been better just to leave the regulations for dealing with contaminated land on a reactive basis as local authorities become aware of them.

Well there always was really a pro-active duty to inspect, but that was always interpreted a little bit reactively. I think that if you look across the piece you do have to say that there is a need to be more strategic to find the potential problems - you can make that case in terms of public health and the environment generally and you can also make it in terms of the kind of urban regeneration type implications. If there's the thought that maybe somebody somewhere - might just about trip over it. there's enough of a concern that with the system we have got - what do we do while we are waiting for the local authority to get round to inspect this site.

Its a bit of a sort of Noddy argument on a real site, but that is enough there when you have got a pro-active duty. If it was all reactive - it really wouldn't work. But if you were more or less entirely reactive - you really don't get anywhere, because the nature of the risks are such that you are not really discover them by accident. So take the biggy case that we have got running at the moment - The Western Quarries site near Runcorn. That has been found because in this case the company responsible ICI have done a lot of very detailed work starting from first principles - what did we do in the area, what problems might that have caused - they then go on to discover by trying to prove the negative. That down the line they eventually discover the problem of HCBD penetrating into housing in ways from a technical point of view you would

never have expected from the basis of what was know and assumed about the conditions of the site - you wouldn't have anticipated that. But because they have been pro-active about looking for it they have found it, and now we are in a situation where 21 houses and a scout hut have had to be abandoned. You wouldn't have found that reactively.

Now hat you also get is an increasing awareness of this type of issue for the ones that you do find and what is absolutely clear in the business of risk communication is that if you look like you are being reactive - if you look like you are just blundering into things by accident - you don't look like you ought to inspire any confidence in anybody else. So anything that could create a fear and anxiety and blight in an area is going to be exacerbated if you look reactively - because that looks defensive - its not kind of providing any positive reassurance at all.

8. In terms of risk assessment. In Part IIA you have adopted the policy of accessing sites on a site specific basis - were there any other options considered?

There are two different questions in that. The first is the distinction between a direct risk based approach and a proxy approach. I'll open that up a bit more. The legislation defines things in terms of the risk. The actual legal test describes in qualitative terms a risk. Now some other countries with similar overall policy frameworks have then augmented that - replaced that - by saying what we actually mean here is that we are going to actually publish a list of legal limit values and if you are above a limit value.

If you use the risk concept to derive the level at which to set a limit value. We took the view that a numbers based approach was not going to be satisfactory. It has been reviewed at various different times - actually quite early on - quite big discussions in the Inter-departmental Committee that ran the policy review back in 1993/4 on the whole question of standards and what they might mean. The view was that if you take the numerical point of view then you have got whole pile of problems. Firstly it means that you actually get your risk levels wrong in virtually all cases, because the actual parameters affecting the risks on any individual site varies so much. So in some sites you are going to be unnecessarily precautionary in others you are going to miss the real risk that is there. That is even where you have got a problem. But if you get people thinking in terms of numbers - they forget all the other substances - nobody in the world has a limit value or guideline value for HCBDs in soils. There is an occupational exposure limit but there is no domestic exposure limit currently around.

Now the commission of toxicology in the Department of Health are actually producing one, because we have found a site with it in. But if we have a legal regime based upon a published list of numbers - it doesn't trigger that what we have got is regarded as sufficient health risk, that we have evacuated twenty one houses and a scout hut - so you are going to miss a whole pile and if you start thinking that not being contaminated is about being below the numbers - you end up painting by numbers - and you see already within our system that people have tested against the ICRCL guideline values, blindly - not thinking about what might be on the site or cause risks on the site - they have tested

against that - statistically made some pretty weird assumptions correlating their site values with the published values and then make sweeping conclusions - that this site is not contaminated. What have they looked for - why should they be looking for it, what should they be doing, what type of assessment method are they really using to correlate a set of numbers against a set of numbers. It steers people in technically daft directions if you are not careful. So we took the conclusion that we actually wanted to run the legal tests directly on the qualitative factors, which you might then exemplify by technical advice and technical guidance - but you can always re-evaluate the ways in which they really apply.

Then there is really a second element of your original question - which is really in effect about buying in numbers from else where. And the numbers that people are frequently trying to buy into are the Dutch numbers. Now the person who loathes that as practice the most is the guy who invented the Dutch numbers - he is horrified he's a guy called Hugh Dennermann, who did quite a lot of the scientific work. He is horrified. you know the Dutch guideline line values, the various values the old A, B, C's or the interventions and targets are fine if you happen to be in the Netherlands so if you have got their characteristic land uses - you have got their characteristic geology, their characteristic hydrogeology their particular views on their intellectual framework for remediating soils. They were at the time dedicated to multifunctionality although they no longer are so. But then you start getting - they feed other technical policy questions through in different ways. They measure back ground exposure for example totally differently from a way in which we would actually think valid. So in terms their actual work in terms of the human health element we would actually suggest that the Dutch Human Health values, for the human health component aren't stringent enough - now that is actually an interesting conclusion - people actually think that the Dutch numbers are the bees knees and the toughest ones there are. But in terms of human health they are certainly not.

If you want to look at the human health levels on arsenic they are happy saying that 460 parts per million is their number, compare that with the United States 0.6 part per million - you can see that perhaps they are not quite the market leader. The basic point is that numbers don't travel and the point that I made about cherry picking and context setting is very important - not only do you have numbers designed to trigger different legal things, so there is a whole world of difference between a screening level which says 'well hang on a minute we ought to have a look at this site' and intervention value which says 'well we ought to be doing something about this site' and a target value that 'if we are doing something this is how far that we ought to go'. Intellectually they are all very different. In terms of derivation they feed in a whole pile of different assumptions about the way in which you might want to model different volume intakes. What is your population exposure to lead in drinking water. That's a real issue. You get quite a lot of policy fudges built in and if you dive in to the derivation of numbers and look at them in real detail you can spot somebody else's fudges which aren't necessarily ones that you would want to make and by the time that you end up multiplying someone else's fudges you end up with something that is wrong, or multiply somebody else's degree of safety, you end up with something that is just stupidly precautionary. So you just really can't just buy them in.

9. Given the apportionment tests is there not a worry that responsible persons will claim hardship and therefore that the costs of cleaning up these sites will fall to the public purse.

Its really going to be a question of seeing how that one is going to shape out in practice. The guidance on hardship is a lot less direct than most of the rest of the guidance. It puts a lot of the decision making down to local authorities. So that they can se how they are going to play this one - and then they might want to adopt their own coherent policy rather than doing each individual one case by case. But it will remain to be seen how that one shapes up in practice. What the guidance is actually talking about. Its actually quite a difficult test for a business to claim hardship.

10. A lot is made in the Guidance about voluntary action - and you have mentioned the case of ICI at Runcorn, but do you think that it is a realistic option for small and medium sized companies?

The pattern seams to be that when you get to the really large plc's that they are really alert to the issues, because they are actually saying what is it saying about our balance sheet what is our contingent liability exposure. Successful due diligence approaches - they are getting alert to the issues. Whether they are alert to the sites that they or a subsidiary may have done dame to a long time ago in the past where they no longer have any connection with the site - that is difficult to predict where those might be - it is that much harder to find them and it is a less clear pattern. But you have got too levels of voluntary action. One is the ICI framework - they are actually trying to find their own problem sites and sort them out - long before a regulator wakes up. That for them is very good business management as well as very good for the environment. Then there is another tier of voluntary action in that a local authority finds that there is a problem and says to the companies around - look you're going to have to do something about this and they then have the opportunity for a voluntarily designed solution. So rather than it been the local authority saying you've got to carry out this programme and do the following. You may end up creating a kind of bespoke solution to the site which is actually being designed by those responsible for the site.

So for example if you were dealing with am site that is currently not in any constructive use - lets say that it is just been used as a bit of spare car parking and somebody comes along and says well come on you've got to do something because it is trashing the river. it is highly likely that the company will take that as a trigger to say well OK then we'll develop out the site. We won't just do the bit to make it a safe car park we will actually design it through and actually take the whole process through. Now they have got the space to do that and the opportunity to do that within the regime. The advantage of that is that they can design a solution that meets their business needs, or better meets their business needs than just shelling out money to comply with the regulatory requirements. It also means that they are more on the front foot.

The regime take a view of what really needs to be done. Now it is likely that by the time to start looking at the risk communication in Urban communities they start thinking -well what else might be there. There is a pressure to do more

there is an anxiety to do more there is pressure from the local community. Now if the company is seen as driving it forward and being positive about things the chances of building support or avoiding unnecessary opposition become that much higher. If you are just reacting or responding you are not doing anything that is going to lay the basic framework of trust in the local community. So you are more in control of the process overall if you are actually driving it forward as a company. There will still be cases where companies don't see why they should be doing anything at all or they are fussing and creating a load of bother about it then they will require a remediation notice that will subsequently be enforced

11. Was there any consideration given to raising a special tax to deal specifically with contaminated land so that it could be dealt with using money from the public purse?

It actually raises some interesting questions. It would probably be illegal under European law to actually do that. The emerging trend of looking at competition policy that allows buyers to fund site clean up. The competition people in the commission would in all probability say to that kind of funding regime - well I'm terribly sorry this is a subsidy to promote businesses - it is an unfair subsidy - and in fact something very similar has actually happened to the Austrian funding regime - which was designed on the idea of a 50% state contribution - it just got ruled illegal by the European Commission. Now we are currently getting problems on the land reclamation programme - the land and property development programme through the regional development agencies. The Commission has started to blow some of those out. So there will be problems on the legality of it. The 'polluter pays principle' is signed up in any number of international treaties and it makes common sense. There is an argument 'why are we imposing a general cost on business to pay for the cost where we can actually say it is a specific cost on an individual business. You then get into more wider questions as to whether the tax and spend route is actually an efficient way of doing it and whether taxes raised for a specific purpose are a good thing at all within the economy. The general government consensus view is that you raise tax and you make spending decisions on different things - you don't raise tax for a specific purpose. So it would have been trying to roll a number of very large logs up a very steep hill to try and adopt that principal as it doesn't match a whole pile of fundamental doctrines about the way we do public business [end of side one]. We at the DETR have in the past talked to the large petrol trading companies to see if they would put together a fund to pay for the clean up of former filling stations.

Various countries have got those, Denmark has got one, the Netherlands has got one, to a greater or lesser extent these are genuinely voluntary - in the Netherlands industry is told you will sign up here voluntarily or we will make it compulsory. We actually came to nowhere and actually floundered in about 1995 in our case because the money for such a scheme would have come from the big oil companies and they took the view that of the petrol stations around the ones which they owned they had already cleaned-up they had already developed them. The sites that would actually be funded would be the ones that are operated by their competitors. By the time you are at the forecourt business level, you have got some sites that are owned by the oil majors and others are owned by individual operators or distributors. So the large oil

companies were saying why should we pay to clean up our competitors sites when we have already paid to clean up ours. It is a fairly convincing bit of business logic really so they weren't going to go with it as a voluntary scheme. You do have to start somewhere in finding the sites that are of interest and starting off with we have got a big programme of funding - you end up not really spending the money on the things that are the priorities.

12. Of the money that was identified as part of the Governments Comprehensive Spending Review - were there any reasons why this money was not ringfenced?

Well there again it is fundamental government doctrines. The agreement between central government and the local government association is that in general should be provided as local grant support of built in to the Standard Spending Assessment and there is local and political accountability as to how that money is spent. Ringfencing it takes away responsibilities removes accountability and is to that extent a bad thing. The other point within it is that if you are producing ringfenced amounts of money - you would really be trying to get horribly specific on what any individual authority needed to spend. Nobody yet has got anywhere near what would be a predictive formula that any authority might need to spend on regulating contaminated land. So on the basis that all money gets distributed anyway - so the same logic applies to all the other services as a whole. the overall sausage machine that is the local authority funding machine. Money gets poured into the hopper at the top and gets dealt out on a broad brush formula basis, And on average the argument that it averages out about right is about as convincing argument as it averages out about wrong. If you start to make some bits of it specific - you create an unbalanced overall picture

The reason I ask that is I have been closely involved with Barnsley MBC in identifying possible strategies and having gone to their financial division with a request for funding have been told that no money will be made available for implementing Part IIA due to other financial pressures.

When it comes down to it Barnsley take a corporate view that they have got more important things to spend their money on than contaminated land - well fine - they can make that view and will be locally and politically accountable for reaching it.

What would happen then in terms of the overall monitoring exercise

Well they might have to justify that view and they might have a tough ride on it but if that is what they are genuinely saying then they are going to be accountable during this exercise to their local voters. So when they say to their local voters that we have advanced your health and environment the most by taking forward an air quality strategy rather than doing an awful lot on contaminated land, the voters will say yes or no on that basis.

Its not going to be a naming and shaming exercise?

Nothing has been designed to be a naming and shaming exercise, but what it does - what the information bits of the new regime do is shine a light on what

has actually happened so that an authority can't just say that well we just can't be bothered with that. They are going to have to make some sort of real view - that it might be nice to do that - but it is going to be better to do something else. So they are going to have to be more transparent in the ways in which they make decisions.

13. Have you any estimates for the amount of contaminated land?

Well the thing that nobody has really costed in a big way is how much it will actually cost to deal with contaminated land rather than just how much it would cost to process the regime. A part of the reason we haven't done that is because we haven't really fundamentally changed the rules. We have got the same amount of contamination to be found and remediated to the same extent as it was before so you can just leave it as value X in the equation and it collapses out if we are looking at a change. Various estimates have been produced. The Environment Agencies 300, 000 hectares seems to be the number that gets banded around more than many. I'm trying to think of the standard remediation costs - which seems to make a reasonable amount of sense.

Different estimates have been made for different purposes and one of the real problems is that what we don't really have any information on is one of the things that has definitely happened which is the land that has been cleaned up as part of the redevelopment process. We have done various exercises at various times looking back at for example the types of industries that would have shown up in the S.143 register. So we have got dry cleaning works. What do we know about how many of those there were. We can actually get numbers on that - typical sizes, and you can start to build up an overall picture. It gets a bit confused because you have multiple uses on the same land, so you can potentially get an over recording, but you can then look at what are the unit costs for taking that kind of site through in various different circumstances.

The total legacy cost of dealing with contaminated land sort of ranges through £12bn to £30bn are numbers that have been produced. What proportion of that is needed in context of the current use of the land, to what extent is that an excess development cost, you actually spend it as a development cost but it should have been a regulatory cost are we saying some of this expenditure is there as development that doesn't really need to be spent but is there to reassure a nervous American inward investor - it is very difficult to unpick the numbers. There was an exercise - we let a contract with WS Atkins - that looked at the cost benefits of remediation - which is unpublished - the works were never completed - the argument moved away.

14 Have you any timescales when you would expect the legislation to kick in or when would you expect to have to increase the SCA budget ?

I seem to remember doing this on a white board somewhere a long-time ago - one of the problems is that it depends what the property market is going to be like over the next few years. If there is a vibrant and buoyant market for land - lots of sites will get cleaned up before the regulators ever get near them. Yet if we move into a nice cyclical slump - then site are just going to sit there and the regulators might find them first. In terms of the Part IIA process we are 2

months in and we are currently on track A number of - the sites that everybody knew about are going through the process and minds are being concentrated on them. So a number of sites have formally been identified as contaminated land and local authorities are starting to develop their strategies. To the extent where they haven't already jumped the gun on doing that anyway. You would expect to see sites that wouldn't previously have been thought about starting to come through at the tail end of this year I suppose. when we start working through - goodness knows whether we will ever reach a peak of activity. One of the things is that the framework is actually designed to encourage local authorities to find the biggest problems first , so driving the strategies and the technical advice is that for it to be a problem you need a contaminant and a receptor - so that's a strategy model to work out where that maybe and lets look there first. Academic questions about stuff that might be going on at the back end of nowhere that is causing very minor water pollution. It poses questions as to whether that is ever going to be enough of a priority that you are ever going to find it. You can hypothesise that if local authorities get their strategy right and follow them up with real types of inspections - the types of sites that end up going through the regulatory process as a result of that pro-active searching will get less and less interesting as you go along.

15. Do you think that the publics perceptions about Part IIA will expect more than it will actually deliver?

Well yes and no. One of the actual drivers behind Part IIA was actually separate the sites that people might chose to be worried about and the sites that they ought to be worried about. That is not been dismissive of the worries of local people, but there are real unacceptable risks and there are, I feel unhappy about it because there might be a bit of a risk. It is an attempt to define the sites that we really need to worry about. Well there is always an element that it sort of lets the cat out of the bag - that there is an issue called contamination that you can worry about - it didn't actually take the legislation to get people worried about their sites it was happening already. There are significant risk communication requirements in terms of building community support for the kind of approaches that are actually going to solve our sites. Rather than the mythical notion that you can actually remove everything to zero - that simply isn't on the market for anything.

You can anticipate that there will be local problems on individual sites that local residents will be concerned. the Runcorn case is an example, ICI have taken on the 21 houses and a scout hut that are directly affected and they have bought 30 houses and issued a price guarantee across a couple of hundred, but it is the next band of properties that aren't remotely affected really by what is going on at western quarries who are saying that the whole area of western is somehow disadvantaged we want a price guarantee as well - well to what extent is that ever going to be reasonable. That kind of price guarantee sort of stuff is nothing that could be enforced through Part IIA anyway. that is something that ICI is doing as part of a corporate good citizen approach - but inevitably the lines have to be drawn somewhere - but people want more. In many cases you are going to get transitional problems research on Blight and Stigma - I think Paul has done some - The Us experience on earthquakes, the effect on property values of a recent earth quake. the fact of the blighting effect of that wears off over five years is quite astounding but it is also reassuring.

Weston Village now is concerned, somebody might say I've seen something about that on the Telly I don't think I want to live there - but once everybody forgets the telly programme it will cease to be an issue. There will be public expectations. People will feel they have been affected more than from a technical viewpoint they have been affected. Some of that is you have got the headless chicken scenario that it must be a problem and they wont address it sensibly.

As an example mortgage lenders look at these kinds of factors by postcode so I think that Weston is WA7. Now if you take their response Ughh there's an issue in Weston what's the postcode - WA7. Right got to be careful about WA7 - but that takes out the whole of Runcorn. If the financial sector responded in a daft way - and they are actually alert to the situation - they know they will just trash themselves if they do. If they were to respond in a daft way then you could end up with totally stupid artificial problems. One of the things we try to do in the margins is talk to the mortgage lenders, estate agents lawyers to say that there is real information - you are just going to have to sit somethings out, but we can put limits on problems quite quickly - just please don't panic too much too soon. The other area where Part IIA might get involved in perspectives and perceptions in that it is able to deliver is the fact that it is actually looking at unacceptable risks in the context of the current use of the land - it is not in itself a program for making the world a better place and turning that nasty eyesore down the end of the road into mythical public park which local residents might think that it ought to be, or bringing back the jobs that they fondly remembered or anything else. Individual authorities will build this kind of work into wider economic development strategies. That's clear they are already saying that publicly - they are already doing that in practice - but Part IIA doesn't deliver that.

16. Do you think that there is any confusion of the role of Part IIA and Planning policy guidance at the present and will the new PPG clarify the roles of the two systems.

Well it ought to and frankly I fail to see - this is a note of despair from me - I fail to see how there can be any confusion as it is quite clear what it is trying to do. The policy is quite clearly set out in that we are making sites suitable for use you make sure that it is suitable for its current use, but then if you introduce a new use you make sure that it is suitable for those. One regime is focusing on current use and the other is focusing on introducing new uses - where's the problem? Sometimes its just stupid transfer of definitions from one context to another where they clearly don't apply. But already the circular on the Part IIA regime sets out at one level of detail what each regime is actually intended to do and the new planning guidance will make this clearer as well as also providing more detail more specific planing guidance relating to land contamination. The existing 4 pages of PPG 23 deal with some quite complex subjects in the space of a couple of sentences such if you know what they are talking about you know what the policy is - if you don't know or a minded not to find out what the issue is you might not know what the policy is.

17. As a final question if you could start again from scratch is there any way that you would change in the way Part IIA was implemented as policy.

Possibly not in terms of where we got the various components. I think in someways some of the things we have just been talking about in terms of - which bit of a regime does what and where we are actually delivering proactive areas of support - maybe some of that could have been spelt out in even more laborious detail. But then there is a big problem of just not reading the words on the page that goes on. the 1994 document *Framework for Contaminated Land* says there is a whole pile of different initiatives are needed. The Government provides funding support, there is the planning regime there is building control. There is a specific regime that deals with spills and legal stuff and there the oohh bloody hell it contaminated land we're going to sort it out bit. That's the bit where we have got the problem so we are going to deal with that now. Everybody forgets the rest of the context and says this specific thing that you are building now doesn't do all these other things - we say well no go back and read the document - it wasn't intended to as something else is already doing those things. Is that something to do with the fact we don't refer to the context enough or is it no matter how much you do people wont actually follow the whole issue because they are actually coming at it...well for me it is the whole of my day job...for somebody else this is Oh god , this is another issue that is making my life a misery and try and do something else so it can be difficult. There are various micro points about the way the regimes emerged where had we known fully where it was going to end up, you might have tackled it in a slightly different way. Something that is utterly trivial - why on earth we put something in the 1995 Act amending something back into the 1990 Act I don't know. Sometimes it just doesn't help for clarity what is going on. Also the primary legislation was heftily reengineered as it went through parliament - it sort of doubled in length as a result of government amendments to get through parliament which means that if you look at it - using an analogy of a printed circuit board you design it for what you think you are going to need you etch it up - but as you design it you get an awful lot of jump leads and crocodile clips and the primary legislation looks like it has got an awful lot of jump leads and crocodile clips. To an extent that is just a fault of the way we produce legislation in the UK which is round the houses and it is quite difficult to work out exactly what it is doing. How it relates to other stuff. Its really for the lawyers rather than anybody else. If you have got the chance to do a law commission re-write on it you could probably write the primary legislation in a way that more immediately transparent to the lay reader.

[End of interview]

Appendix Seven

Copy of Interview Questions

(July – September 2000)

Semi-Structured Interview Questionnaire

1. Could you briefly describe your local authority district in terms of population, area and local economy.

2. What is your background and how did you come to be involved with contaminated land issues

   How long have you been dealing with contaminated land
   Have you been on any training courses relating to Part IIA, if so which?
   What was your first degree
   Are you a member of any professional organisations

3. Is there anybody else in the authority who has any responsibility for dealing with contaminated land?

   What is their role and are you aware of how they became involved with contaminated land?
   Do you know what their background and training are?

4. Which department will be responsible for collating information relating to contaminated land and developing a strategy and why.

5. What other departments are likely to be involved in the contaminated land identification process and what is their likely role?

6. Do you have an inter-departmental contaminated land working party group

   If yes are any of previously mentioned departments represented?

7. In terms of developing and implementing a strategy for identifying contaminated land have you identified any difficulties?

8. What information do you have at your disposal to assist you in determining whether contaminated land exists?

   Maps, planning files, trade directories, geological information

9. Is all the information that you have within your local authority or do you have access to external information? If so from whom?

10. In what format is the above information held, is it on computer or paper based?

11. Are their any substantial deficiencies in the data that you have access to that may inhibit your ability to prioritise land? If yes how will this be resolved?

12. Will the implementation of your strategy require any additional resources to be put in place?
    If so what are they – new staff, software/hardware, technical expertise, training?

13. Have you determined a cost for producing the strategy?

    If so is it possible to have an approximate breakdown of the estimated costs?

14. Has this cost been met by the finance department as a new allocation or have you had to trim existing budgets?

15. How do you intend information in relation to the status of land

    Will it be paper based or on GIS
    If on GIS what systems have you got/looked at?
    Have you chosen particular software package – why?

16. Given your existing knowledge of your area which land uses/areas will you expect to be looking at first and why?

    Former land use/environmental targets/others

17. How would you expect to rank sites in terms of potential risk – will this be a subjective decision based upon the judgement of the evaluator or will it be quantified in some way?

    If so how and is there any way of checking consistency?

18. Have you examined any system for quantifying pathways and receptors in relation to prioritising land for further inspection? If so what does this involve?

19. Have you identified a likely timetable for inspecting and reviewing your area?
    Does your timescale include securing remedial action or just to prioritise the land in your area?

20. What resources, financial and other will be needed to implement your strategy

    In year 1 and succeeding years/
    How will this be financed (existing budgets/new allocation?)

21. Given your knowledge of the area how many sites would you estimate fall into the high risk category – by that I mean ones which would require some form of investigation?

22. Are you aware of any land owned, or previously owned, by the council that may fall within the contaminated land definition? If so – are the sites capable of being redeveloped?

23. Have you made a financial provision for the remediation liability? If so how much?

24. Do you think that public pressure may have a bearing on your authority's inspection strategy? If so in what way?

25. How does your authority intend to deal with public access to information held on GIS, which may include a substantial amount of information about land which may cause harm but cannot be determined as contaminated land? Will it be caveated in some form?

26. Will the register of contaminated land also be on GIS

27. Are you aware of any companies in your area undertaking any voluntary programs of remediation at the present time? If so who?

    To what extent has the LA liaised with these organisations?
    Are you satisfied with the remediation and the liaison?
    Could this possibly used as a case study?

28. Are there any other local authorities that you are working closely with? If so which ones

29. Who is responsible within the Environment Agency for your particular area?

30. What is your relationship with the Environment Agency?

31. Do you have any specific agreements about the transfer of information and how will that information be interpreted?

32. This information has primarily concentrated on strategy development in relation to Part IIA of the Environmental Protection Act 1990. However, do you think that the current guidance will effectively assist in enforcing the remediation of contaminated land in terms of identifying polluters and apportioning responsibility? Please give reasons?

33. For the following set of statements in relation to strategy development could you please state if you strongly agree, agree, neutral, disagree or strongly disagree.

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
We have all the required data to prioritise land in our area	1	2	3	4	5
Contaminated land is the most important issue at the present time for our local authority	1	2	3	4	5
The guidance available to me is sufficient	1	2	3	4	5
I have access to adequate training	1	2	3	4	5
The implementation of our strategy will effectively deal with all contaminated land in our area	1	2	3	4	5
We have a good working relationship with the Environment Agency in relation to contaminated land	1	2	3	4	5
We have not been able to identify financial resources to create a strategy	1	2	3	4	5
We have not been able to identify financial resources to implement a strategy	1	2	3	4	5
We do not have sufficient expertise to prioritise sites	1	2	3	4	5

Appendix Eight

Copy of Letter from DEFRA Formally withdrawing the ICRCL Guidance notes on the Redevelopment of Contaminated Land (ICRCL 59/83 (2nd Edition))

DEFRA

Department for
Environment,
Food & Rural Affairs

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OUR REF: CLAN 1/02

YOUR REF:

20 DECEMBER 2002

Dear Sir or Madam

WITHDRAWAL OF ICRCL GUIDANCE NOTE 59/83 (2ND EDITION)

This letter is to let you know of the withdrawal of a guidance note about contaminated land which has been widely used since 1987 but which is now out of date.

Earlier this year, Defra and the Environment Agency published new technical documents relevant to the assessment of human health risks arising from contaminants in soil. The CLEA package, consisting of the main Contaminated Land Reports (CLRs) 7 - 10, the CLEA 2002 software, and the Soil Guideline Values for individual substances (SGV), are now considered to represent the key instruments for generic assessment of the human health risks from land contamination. They represent a cross-Government consensus on the technical approach to undertaking such assessments and are based on the latest scientific knowledge and thinking.

Details of the new CLRs and SGVs (and Tox papers) can be found at http://www.defra.gov.uk/environment/landliability/pubs.htm - 3. Technical enquiries about the new CLR series and related material should be addressed as shown there.

On the advice of the Environment Agency, and in consultation with other Government Departments, we have therefore now withdrawn the main DOE technical document previously used to help assess land contamination. This is ICRCL Guidance Note 59/83 (2nd edition), first published in 1983 and updated in 1987, which was prepared by the former Inter-Departmental Committee on the Redevelopment of Contaminated Land (hence "ICRCL").

ICRCL 59/83 contained "trigger values" for a series of substances commonly found in contaminated land. These have been a useful tool, but are now technically out of date and their approach is not in line with the current statutory regime (Part IIA of the Environmental Protection Act 1990) and associated policy. In particular, they are not suitable for assessing the "significant possibility of significant harm" to human health, which the regime calls for.

ICRCL end STL doc

NOTE ON THE WITHDRAWAL OF ICRCL TRIGGER VALUES

This briefing note, prepared with the help of the Environment Agency, explains the background to the decision by Defra formally to withdraw ICRCL Guidance Note 59/83, 2nd edition, dated July 1987. The decision was conveyed in a letter dated 20 December 2002 which has been sent to local authorities and other stakeholders, and placed on the Defra webpages about contaminated land.

Background

In March 2002, the Department for Environment, Food and Rural Affairs (Defra) and the Environment Agency published a comprehensive package of technical guidance relevant to the assessment of human health risks arising from long-term exposure to contaminants in soil. The Government's view is that this package supersedes, in respect of human health, earlier work published by the Interdepartmental Committee on the Redevelopment of Contaminated Land (ICRCL), and in particular, the Trigger Values set out in ICRCL 59/83.

The CLEA package, consisting of the main reports CLR 7 - 10, the CLEA 2002 software and the Soil Guideline Values for individual substances (SGV) are now considered to represent the key instruments for generic assessment of the health risks from land contamination. They represent a cross-government consensus on the technical approach to undertaking such assessments and are based on the latest scientific knowledge and thinking.

The ICRCL Guidance Notes have represented an important source of guidance to practitioners dealing with the many hazards and different types of historical contamination that can be found in the UK. The most well-known of these documents is Guidance Note 59/83, revised in July 1987, which sets out a number of Trigger Values (threshold and action concentrations) for contaminants in soil including ten metals, cyanides, sulphates, PAHs and phenols.

The Trigger Values were intended to provide an indirect method of assessing the risk from levels of contamination in soil according to land-use. For each contaminant three possible concentration zones were set out - namely, areas of acceptable and unacceptable risk separated by a zone for professional judgement. In theory, threshold and action values based on the total concentration of the contaminant in soil would establish the boundary between these zones. In practice, for many of the common metal contaminants only the threshold values were established and over time their purpose has been confused with that of remediation standards.

The new CLEA package deals with the direct assessment of risks to human health from soil contamination. They are based on:

- Toxicological criteria that establish a level of unacceptable human intake of a contaminant derived from soil.
- Estimates of human exposure to soil contamination based on generic land-use, which take into account the characteristics of adults and children, their activity patterns and the fate and transport of the contaminant in soil.

Soil Guideline Values for individual substances have been published covering a similar range of contaminants to those set out in ICRCL Note 59/83.

SGV are generic assessment criteria. They are indicators for "intervention" either in the form of further detailed risk assessment and/or remediation. The approach taken is in line with Government policy objectives and guidance, for example the DETR/Environment Agency/Institute for Environment and Health "*Guidelines for Environmental Risk Assessment and Management*", published in July 2000, available at www.defra.gov.uk/environment/eramguide/index.htm (also available from The Stationery Office); and the approach closely relates to the requirements in the Statutory Guidance for Part IIA of the Environmental Protection Act 1990 (Part IIA).

Why withdraw ICRCL 59/83?

The ICRCL Guidance, and in particular the trigger values set out in Note 59/83 were last revised in July 1987. In 1990 the House of Commons Select Committee on the Environment identified problems with this guidance in their report on contaminated land. The Committee called for a system of statutory soil quality objectives and standards, more scientifically-based guidance, and general improvements in professional standards.

The Government's response accepted that more work was needed on the development of guidance in the assessment of land contamination. However, it rejected the idea of statutory objectives and standards covering all circumstances. The Government focused research effort towards the development of more extensive guidance covering a number of different aspects of risk assessment, including the development of the new CLEA package of technical guidance relevant to considering the direct risks to human health.

The ICRCL trigger values are not suitable for assessing the "significant possibility of significant harm to human health" in the context of the Part IIA regime. In our view they do not meet the requirements for guideline values set out in paragraph B.47 of the Part IIA statutory guidance. Their derivation is not consistent with the type of harm described in Tables A and B of that guidance. In contrast the new SGV take full account of the statutory guidance and have been developed to be consistent with the modern approach to such assessments set out under Part IIA.

Against this background, it has been decided to withdraw ICRCL Note 59/83 in its entirety. It is recognised that the new SGV do not represent an exact replacement of every Trigger Value in Note 59/83. In some cases this is a function of the substance, land-use or hazard concerned. However, it is our view that a phased approach to the replacement of ICRCL Trigger Values on a *like for like* basis poses a number of problems and would represent an unacceptable source of uncertainty and confusion to UK practitioners. Examples of these problems are outlined below:

- In ICRCL Note 59/83, Trigger Values for polyaromatic hydrocarbons (PAHs) are presented. At the time of publication, this was a pragmatic solution to limitations in

our understanding of PAHs and our ability to differentiate individual PAHs in soil analysis. However, there will not be a Soil Guideline Value to directly replace this Trigger Value. Instead SGV are currently in preparation for a number of individual PAHs, focusing in particular on those that pose the most significant risk to health such as benzo[a]pyrene. Currently the analysis of individual PAHs in soil is a fairly routine procedure. In addition, advice from the Department of Health is that the potential health risks of PAHs should not be considered as a group. Given these factors it is difficult to support the continued use of a Trigger Value for PAHs.

- In ICRCL Note 59/83, Trigger Values are provided for a "parks, playing fields, and open spaces" and a "landscaped areas" land-use. These are not currently considered in the CLEA package and no SGV have been specifically set although further work is planned on considering leisure uses in 2003. It should be noted however that for substances where SGV have already been established there is a considerable mismatch with related Trigger Values. For example, for chromium VI the Trigger Value for "parks, playing fields, and open spaces" is 25 $mg.kg^{-1}$, a value nearly ten times lower than the corresponding SGV for "residential without plant uptake". Clearly the latter is likely to be the more sensitive land-use and therefore the ICRCL Trigger Value significantly overestimates the potential risk to health. For selenium, the Trigger Value for "parks" is 6 $mg.kg^{-1}$, a factor of 6 lower than the SGV for "residential with plant uptake" and a factor of 40 lower than the SGV for "residential without plant uptake".

What if no SGV is available ?

Soil Guideline Values are intended to be just that: guidelines for consideration early and often in the process of risk-based management of sites. They serve a useful purpose in encouraging a transparent and consistent approach and can also be helpful in focusing resources on situations that require more detailed assessment. However, they do not stand alone. SGV therefore inform judgements about the need for action but sit within a wider risk-based approach set out in Part IIA and the statutory guidance, and supported by the CLR documents 7–10. Thus, even where a SGV has been published it should only be used after the assessor has satisfied him/herself that all the conditions assumed are appropriate for the site.

It will never be practicable to devise SGVs for all substances which occur in land contamination cases. CLR7 paragraph 4.15 indicates that where no SGV has been published, a risk assessment at the site using site-specific criteria should be considered, and refers to CLR 9 and 10 in this respect. This means an approach based on a conceptual site model as described in CLR10. In this way, an appropriate level of site-specific risk assessment can be used to inform the decision-making process. CLR 7 also refers to further proposed guidance - "Model Procedures" - the revised draft of which is now well advanced.

Why not withdraw all ICRCL notes?

Clearly, the ICRCL guidance consists of much more than Note 59/83 and it recognised that many of the other notes provide more general information useful to the assessor,

relevant to contaminant hazards not considered by the CLEA package, such as phytotoxicity and subterranean fires, or which discussed the investigation of certain historical land-uses that informs the wider assessment process. In our view continuing to support this wider guidance would not cause any confusion with the CLEA package[1]. We do, however, consider that ICRCL Notes should not be used as the sole source of information on which decisions are based. Rather they are one of a range of different sources of information, including more recent guidance, which can be used in undertaking assessments.

Conclusion

ICRCL Guidance Note 59/83, 2nd edition, and especially Table 3 and Table 4, should no longer be quoted or used. Copies will however remain available on request for their historical relevance.

Contaminated Land Branch
Defra

December 2002

[1] ICRCL Note 70/90 on the restoration and aftercare of metalliferous mining sites presents Trigger Values for 5 metals and fluoride for protection of grazing livestock and crop growth.

Appendix Nine

Copy of Follow-up Questionnaires

(October 2003)

Focus Group Discussion Follow-up Research Questionnaire

The Original Discussion Topics

Discussion Topic 1

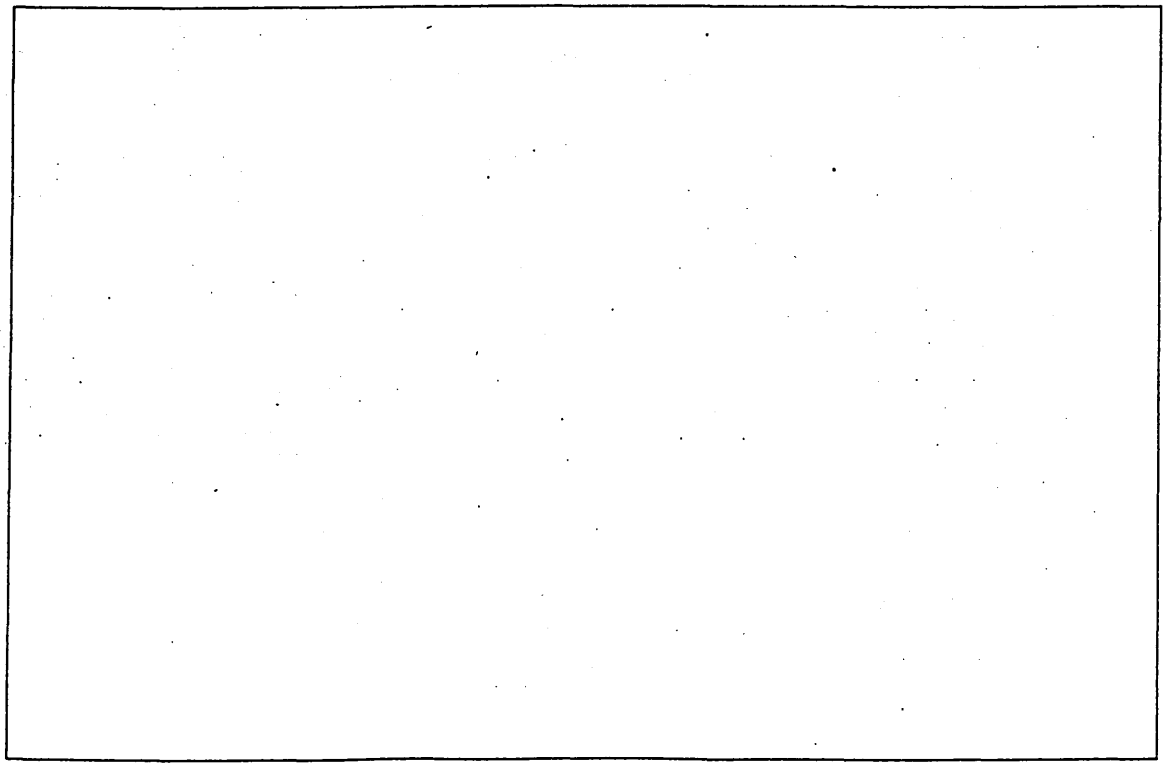
Part IIA of the Environment Act requires local authorities to inspect their areas for the purpose of identifying contaminated land in its area. There is now some funding which has been made available by DETR to undertake this statutory obligation. Nevertheless there are several practical implications for local authorities. The draft guidance (and the revised draft guidance) requires local authorities to prepare and implement a strategy within 15 months of the guidance coming into force. The first stage seems to be identifying which local authority officers will be responsible for identifying potentially contaminated sites?

VI. Do you see it as a primarily Planning or Environmental Health role?
VII. Who will carry out what duties?
VIII. What information is available?
IX. Is the information accessible and easy to interpret?
X. How will information be stored and who will have access to it?

Supplementary Questions

The Statutory Guidance has now been in place for 3.½ years can you please provide details of:

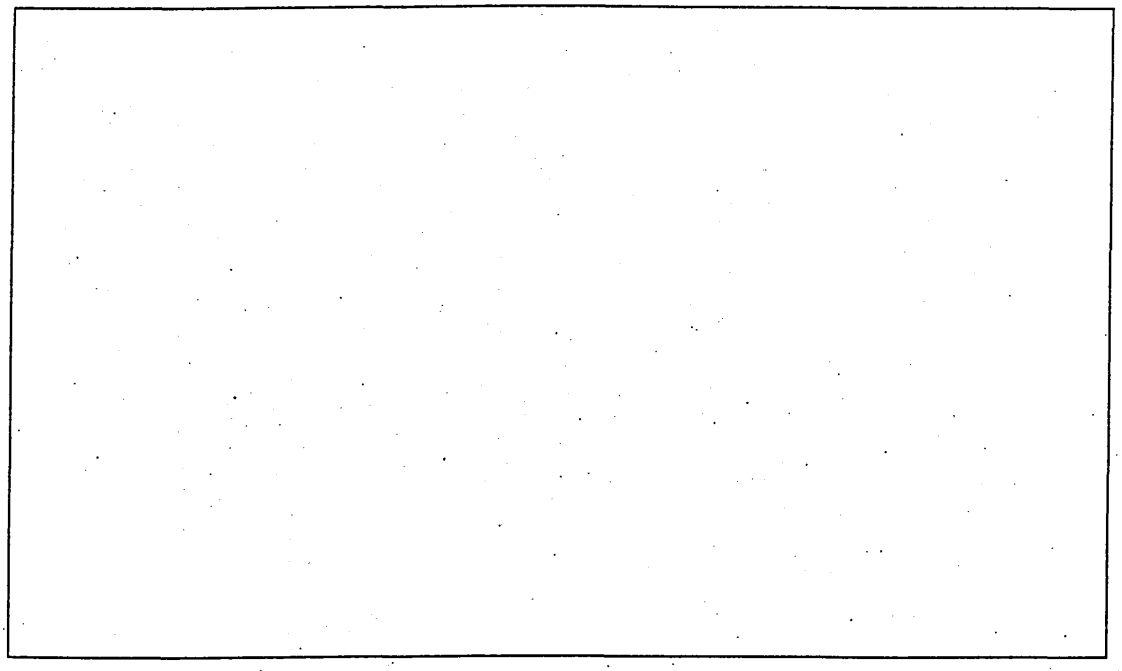
- Which department/ Service has what responsibility for contaminated land
- What information you have available to prioritise contaminated land, how this is stored and who has access to this information?



Having identified and collated existing information what processes can be used to determine the possibility of a site causing significant harm?

IV. What information is deemed sufficient to make contact with the site owner/ undertake intrusive investigations?
V. What risk assessment procedures are being looked at?
VI. How will potential targets be identified/prioritsised?

Please can you provide a response to the above questions in the box provided below:



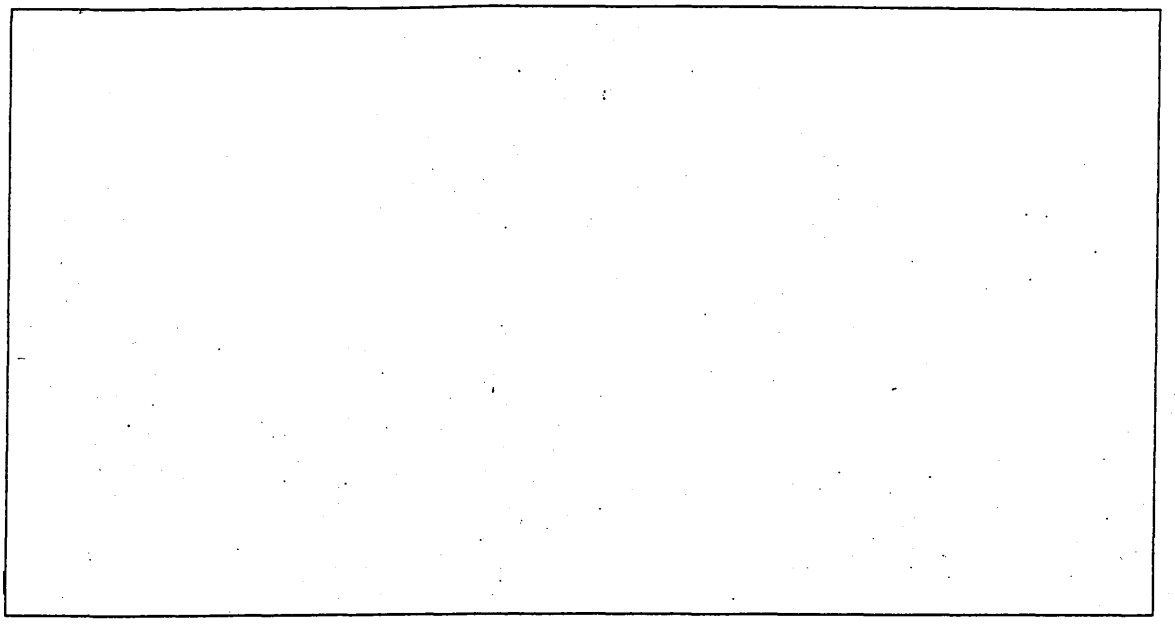
Discussion Topic 3

In certain circumstances contamination of groundwater may be an issue for local authorities. In such circumstances how will local authorities interact with the Environment Agency?

V. What information will the Environment Agency give?
VI. How will that information be used by local authorities?
VII. Will information from the Environment Agency be relied upon if a consultants report suggests that there is no contamination?
VIII. What is the legal status of Environment Agency Information?

Supplementary Questions

What types of information and advice have you received from the Environment Agency
Has the information/advice helped you with the regulation of contaminated land
Have you acted in accordance with the advice given by the Environment Agency? If not why not?

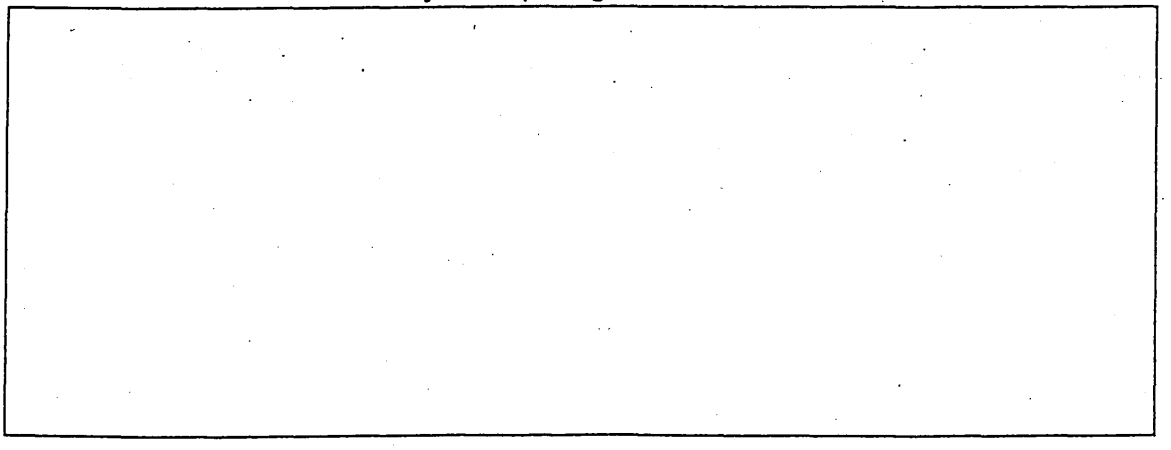


It is the government's intention that contaminated land is brought back into beneficial use through the development system (Framework for Contaminated Land, 1995). This has implications both in terms of Planning Control and Part IIA. Where a planning application is received adjacent to a former gas works site and there is significant pressure for the housing development how do local authorities proceed? On the one hand there is political pressure to see housing developed, on the other hand by allowing the development to go ahead are you creating the possibility that the former gas works site could cause significant harm?

VI. How will information from third parties (developers, consultants) be used?
VII. How will its quality be assessed?
VIII. How will developments be regulated - will consultants information be relied upon?
IX. If not what are the alternatives?
X. Is the legislation likely to favour developers?

Supplementary Questions

- Have you had any conflicts between Part IIA and the planning process?
- Have any potential 'contaminated land' sites been dealt with through the planning process?
- What information are you requiring from consultants?



5. Have any authorities looked at the cost of producing and implementing a strategy?

- Who?
- How much?
- Who responsible for what?
- What timescales?
- What methodology have you used to determine whether a site presents a significant risk of being contaminated?
- How much land in your area would you estimate may be contaminated within the legal definition?

Supplementary Questions

Based on your current circumstances please could you please provide a brief response to the above questions.

Please use the box below to add any other relevant information in particular problems that you have encountered that are providing barriers to your effective implementation of Part IIA.

Thank you for your time

Interview Phase Follow Up Questions October 2003

1. Which department was responsible for collating information relating to contaminated land and developing a strategy?

2. Was the strategy developed using existing staff, new staff, or external consultants?

3. Do you have an inter-departmental contaminated land working party group?

   If yes which departments are involved?

4. How do you intend to hold information in relation to the status of land? -

   Will it be paper based or on GIS

   If on GIS what software systems have you got/looked at? (MapInfo, Arcview?)

5. Have you examined any system for quantifying pathways and receptors in relation to prioritising land for further inspection?

   If yes which system have you chosen?

6. Will the information that is presently available to your local authority be sufficient to enable a decision to be made relating to the sites potential to be contaminated?

   If not what additional data do you require?

7. Has your authority determined a cost for implementing the strategy?

   If so can you provide an approximate budget cost?

8. Has this cost been met by the finance department as a new allocation or have you had to trim existing budgets?

9. Has the implementation of your strategy required any additional resources to be put in place?

   If so what are they – new staff, software/hardware, technical expertise, training?

10. Have you investigated any potentially contaminated land sites – has this had an impact on resources? If so how has this been dealt with?

11. Have you identified a likely timetable for inspecting and reviewing your area?

    If yes what are the estimated timescales for prioritising land in your area?

12. Have there been any delays in your overall progress with the implementation of your strategy?

    If yes please provide reasons

13. At this stage in your strategy how many sites have you identified that may require further investigation?

14. Have you determined any sites as contaminated?

    If yes how many?

15. Has public pressure had a bearing on your authority's inspection strategy?

    If so in what way?

16. How is your authority dealing with requests for information held on GIS?

17. Have you had any site-specific advice from the Environment Agency in your region?

    If yes what was the nature of the advice?

18. Have you identified any specific requirements for additional training guidance that would assist with the implementation of your strategy? If yes please describe.

19. For the following set of statements in relation to strategy development could you please state if you strongly agree, agree, neutral, disagree or strongly disagree.

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
We have all the required data to prioritise land in our area	1	2	3	4	5
Contaminated land is the most important issue at the present time for our local authority	1	2	3	4	5
The guidance available to me is sufficient	1	2	3	4	5
I have access to adequate training	1	2	3	4	5
The implementation of our strategy will effectively deal with all contaminated land in our area	1	2	3	4	5
We have a good working relationship with the Environment Agency in relation to contaminated land	1	2	3	4	5
We have not been able to identify financial resources to implement our strategy	1	2	3	4	5
We do not have sufficient expertise to prioritise sites	1	2	3	4	5
The implementation of Part IIA has had an impact on the approach of developers on land affected by contamination	1	2	3	4	5

20. Are there any other issues that are having an impact on the overall effectiveness and progress of your local authority inspection strategy?

    If yes please describe.

Appendix Ten

Site Prioritisation Calculation using USEPA Pre-Score.

**** CONFIDENTIAL ****
****PRE-DECISIONAL DOCUMENT ****
**** SUMMARY SCORESHEET ****
**** FOR COMPUTING PROJECTED HRS SCORE ****

**** Do Not Cite or Quote ****

Site Name: Totley

Region:

City, County, State: Sheffield

Evaluator: Peter Knight

EPA ID#:

Date:

Lat/Long:

T/R/S:

Congressional District:

This Scoresheet is for: Pre-CERCLIS Screening

Scenario Name: test1

Description:

	S pathway	S^2 pathway
Ground Water Migration Pathway Score (S_{gw})	0	0
Surface Water Migration Pathway Score (S_{sw})	0	0
Soil Exposure Pathway Score (S_s)	66.67	4444.8889
Air Migration Score (S_a)	0.0050909090909090 9	2.59173553719008 E-5
$S^2_{gw} + S^2_{sw} + S^2_s + S^2_a$		4444.88892591736
$(S^2_{gw} + S^2_{sw} + S^2_s + S^2_a)/4$		1111.22223147934
O $(S^2_{gw} + S^2_{sw} + S^2_s + S^2_a)/4$		33.34

athways not assigned a score (explain):

TABLE 3-1 –GROUND WATER MIGRATION PATHWAY SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned
Aquifer Evaluated:		
Likelihood of Release to an Aquifer:		
1. Observed Release	550	0
2. Potential to Release:		
2a. Containment	10	
2b. Net Precipitation	10	
2c. Depth to Aquifer	5	
2d. Travel Time	35	
2e. Potential to Release [lines 2a(2b + 2c + 2d)]	500	
3. Likelihood of Release (higher of lines 1 and 2e)	550	0
Waste Characteristics:		
4. Toxicity/Mobility	(a)	
5. Hazardous Waste Quantity	(a)	
6. Waste Characteristics	100	
Targets:		
7. Nearest Well	(b)	0
8. Population:		
8a. Level I Concentrations	(b)	
8b. Level II Concentrations	(b)	
8c. Potential Contamination	(b)	
8d. Population (lines 8a + 8b + 8c)	(b)	
9. Resources	5	
10. Wellhead Protection Area	20	
11. Targets (lines 7 + 8d + 9 + 10)	(b)	0
Ground Water Migration Score for an Aquifer:		
12. Aquifer Score [(lines 3 x 6 x 11)/82,5000][c]	100	0
Ground Water Migration Pathway Score:		
13. Pathway Score (S_{gw}), (highest value from line 12 for all aquifers evaluated)[c]	100	0

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] Do not round to nearest integer

LVII

TABLE 4-1 --SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned	
shed Evaluated:			
Drinking Water Threat			
ıood of Release:			
1. Observed Release	550	0	
2. Potential to Release by Overland Flow:			
2a. Containment	10		
2b. Runoff	10		
2c. Distance to Surface Water	5		
2d. Potential to Release by Overland Flow [lines 2a(2b + 2c)]	35		
3.Potential to Release by Flood:			
3a. Containment (Flood)	10		
3b. Flood Frequency	50		
3c. Potential to Release by Flood (lines 3a x 3b)	500		
4. Potential to Release (lines 2d + 3c, subject to a maximum of 500)	500		
5. Likelihood of Release (higher of lines 1 and 4)	550		0
Characteristics:			
6. Toxicity/Persistence	(a)		
7. Hazardous Waste Quantity	(a)		
8. Waste Characteristics	100		0
s:			
9. Nearest Intake	50		
10. Population:			
10a. Level I Concentrations	(b)		
10b. Level II Concentrations	(b)		
10c. Potential Contamination	(b)		
10d. Population (lines 10a + 10b + 10c)	(b)		
11. Resources	5		
12. Targets (lines 9 + 10d + 11)	(b)		
ng Water Threat Score:			
13. Drinking Water Threat Score [(lines 5x8x12)/82,500, subject to a max of 100]	100		0
Human Food Chain Threat			
ıood of Release:			
14. Likelihood of Release (same value as line 5)	550		0
Characteristics:			
15. Toxicity/Persistence/Bioaccumulation	(a)		
16. Hazardous Waste Quantity	(a)	0	
17. Waste Characteristics	1000		0
ts:			
18. Food Chain Individual	50		
19. Population			
19a. Level I Concentration	(b)		
19b. Level II Concentration	(b)		
19c. Potential Human Food Chain Contamination	(b)		
19d. Population (lines 19a + 19b + 19c)	(b)		
20. Targets (lines 18 + 19d)	(b)		
ın Food Chain Threat Score:			
21. Human Food Chain Threat Score [(lines 14x17x20)/82500, subject to max of 100]	100		0
Environmental Threat			
hood of Release:			
22. Likelihood of Release (same value as line 5)	550		0
Characterlstics:			
23. Ecosystem Toxicity/Persistence/Bioaccumulation	(a)		
24. Hazardous Waste Quantity	(a)	0	
25. Waste Characteristics	1000		0
Targets:			
26. Sensitive Environments			
26a. Level I Concentrations	(b)		
26b. Level II Concentrations	(b)		
26c. Potential Contamination	(b)		
26d. Sensitive Environments (lines 26a + 26b + 26c)	(b)		
27. Targets (value from line 26d)	(b)		
Environmental Threat Score:			
28. Environmental Threat Score [(lines 22x25x27)/82,500 subject to a max of 60]	60		0
Surface Water Overland/Flood Migration Component Score for a Watershed			
29. Watershed Score[c] (lines 13+21+28, subject to a max of 100)	100		0
Surface Water Overland/Flood Migration Component Score			
30. Component Score (S_{sw})[c] (highest score from line 29 for all watersheds evaluated)	100		0

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] Do not round to nearest integer

TABLE 4-25 --GROUND WATER TO SURFACE WATER MIGRATION COMPONENT SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned	
ilfer Evaluated:			
Drinking Water Threat			
elihood of Release to an Aquifer:			
1. Observed Release	550	0	
2. Potential to Release:			
2a. Containment	10		
2b. Net Precipitation	10		
2c. Depth to Aquifer	5		
2d. Travel Time	35		
2e. Potential to Release [lines 2a(2b + 2c + 2d)]	500		
3. Likelihood of Release (higher of lines 1 and 2e)	550		0
ste Characteristics:			
4. Toxicity/Mobility	(a)		
5. Hazardous Waste Quantity	(a)		
6. Waste Characteristics	100		0
gets:			
7. Nearest Well	(b)		
8. Population:			
8a. Level I Concentrations	(b)		
8b. Level II Concentrations	(b)		
8c. Potential Contamination	(b)		
8d. Population (lines 8a + 8b + 8c)	(b)		
9. Resources	5		
10. Targets (lines 7 + 8d + 9)	(b)		
iking Water Threat Score:			
11. Drinking Water Threat Score ([lines 3 x 6 x 10]/82,500, subject to max of 100)	100		0
Human Food Chain Threat			
elihood of Release:			
12. Likelihood of Release (same value as line 3)	550		0
ste Characteristics:			
13. Toxicity/Mobility/Persistence/Bioaccumulation	(a)		
14. Hazardous Waste Quantity	(a)	0	
15. Waste Characteristics	1000		0
gets:			
16. Food Chain Individual	50		
17. Population			
17a. Level I Concentration	(b)		
17b. Level II Concentration	(b)		
17c. Potential Human Food Chain Contamination	(b)		
17d. Population (lines 17a + 17b + 17c)	(b)		
18. Targets (lines 16 + 17d)	(b)		
nan Food Chain Threat Score:			
19. Human Food Chain Threat Score [(lines 12x15x18)/82,500,subject to max of 100]	100		0
Environmental Threat			
elihood of Release:			
20. Likelihood of Release (same value as line 3).	550		0
ste Characteristics:			
21. Ecosystem Toxicity/Persistence/Bioaccumulation	(a)		
22. Hazardous Waste Quantity	(a)	0	
23. Waste Characteristics	1000		0
gets:			
24. Sensitive Environments			
24a. Level I Concentrations	(b)		
24b. Level II Concentrations	(b)		
24c. Potential Contamination	(b)		
24d. Sensitive Environments (lines 24a + 24b + 24c)	(b)		
25. Targets (value from line 24d)	(b)		
Environmental Threat Score:			
26. Environmental Threat Score [(lines 20x23x25)/82,500 subject to a max of 60]	60		0
Ground Water to Surface Water Migration Component Score for a Watershed			
27. Watershed Score[c] (lines 11 + 19 + 28, subject to a max of 100)	100		0
28. Component Score (S_{gs})[c] (highest score from line 27 for all watersheds evaluated, subject to a max of 100)	100		0

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] Do not round to nearest integer

TABLE 5-1 --SOIL EXPOSURE PATHWAY SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned	
ood of Exposure:			
Ikelihood of Exposure	550		550
Characteristics:			
oxicity	(a)	10000	
lazardous Waste Quantity	(a)	10000	
Vaste Characteristics	100		100
s:			
esident Individual	50	50	
esident Population:			
6a. Level I Concentrations	(b)	50	
6b. Level II Concentrations	(b)		
6c. Population (lines 6a + 6b)	(b)	50	
orkers	15	0	
esources	5	0	
errestrial Sensitive Environments	(c)		
Targets (lines 5 + 6c + 7 + 8 + 9)	(b)		100
nt Population Threat Score			
Resident Population Threat Score (lines 1 x 4 x 10)	(b)		5500000
Nearby Population Threat			
ood of Exposure:			
Attractiveness/Accessibility	100	25	
Area of Contamination	100	20	
Likelihood of Exposure	500		5
Characteristics:			
Toxicity	(a)	10000	
Hazardous Waste Quantity	(a)		
Waste Characteristics	100		0
s:			
Nearby Individual	1	0	
Population Within 1 Mile	(b)	500	
Targets (lines 18 + 19)	(b)		500
/ Population Threat Score			
Nearby Population Threat (lines 14 x 17 x 20)	(b)		0
posure Pathway Score:			
Pathway Score[d] (S_p), [lines (11+21)/82,500, subject to max of 100]	100		66.67

aximum value applies to waste characteristics category
aximum value not applicable
o specific maximum value applies to factor. However, pathway score based solely on terrestrial sensitive environments is limited
maximum of 60
o not round to nearest integer

TABLE 6-1 --AIR MIGRATION PATHWAY SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned	
Likelihood of Release:			
1. Observed Release	550	0	
2. Potential to Release:			
2a. Gas Potential to Release	500		
2b. Particulate Potential to Release	500	6	
2c. Potential to Release (higher of lines 2a and 2b)	500	6	
3. Likelihood of Release (higher of lines 1 and 2c)	550		6
Waste Characteristics:			
4. Toxicity/Mobility	(a)	10000	
5. Hazardous Waste Quantity	(a)	1	
6. Waste Characteristics	100		10
Targets:			
7. Nearest Individual	50	7	
8. Population:			
8a. Level I Concentrations	(b)		
8b. Level II Concentrations	(b)		
8c. Potential Contamination	(c)		
8d. Population (lines 8a + 8b + 8c)	(b)		
9. Resources	5		
10. Sensitive Environments:			
10a. Actual Contamination	(c)		
10b. Potential Contamination	(c)		
10c. Sensitive Environments (lines 10a + 10b)	(c)		
11. Targets (lines 7 + 8d + 9 + 10c)	(b)		7
Air Migration Pathway Score:			
12. Pathway Score (S_a) [(lines 3 x 6 x 11)/82,500][d]	100		0.0050909090909 0909

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] No specific maximum value applies to factor. However, pathway score based solely on sensitive environments is limited to a maximum of 60.
[d] Do not round to nearest integer

APPENDIX A

OMB Approval Number: 2050-0095
Approved for Use Through: 1/92

PA Scoresheets

Site Name:_____ Investigator:_____

CERCLIS ID No.:_____ Agency/Organization:_____

Street Address:_____ Street Address:_____

City/State/Zip:_____ City/State/Zip:_____

Date:_____

INSTRUCTIONS FOR SCORESHEETS

Introduction

This scoresheets package functions as a self-contained workbook providing all of the basic tools to apply collected data and calculate a PA score. Note that a computerized scoring tool, "PA-Score," is also available from EPA (Office of Solid Waste and Emergency Response, Directive 9345.1-11). The scoresheets provide space to:

- Record information collected during the PA
- Indicate references to support information
- Select and assign values ("scores") for factors
- Calculate pathway scores
- Calculate the site score

Do not enter values or scores in shaded areas of the scoresheets. You are encouraged to write notes on the scoresheets and especially on the Criteria Lists. On scoresheets with a reference column, indicate a number corresponding to attached sources of information or pages containing rationale for hypotheses; attach to the scoresheets a numbered list of these references. Evaluate all four pathways. Complete all Criteria Lists, scoresheets, and tables. Show calculations, as appropriate. If scoresheets are photocopy reproduced, copy and submit the numbered pages (right-side pages) only.

GENERAL INFORMATION

Site Description and Operational History: Briefly describe the site and its operating history. Provide the site name, owner/operator, type of facility and operations, size of property, active or inactive status, and years of waste generation. Summarize waste treatment, storage, or disposal activities that have or may have occurred at the site; note also if these activities are documented or alleged. Identify probable source types and prior spills. Summarize highlights of previous investigations.

Probable Substances of Concern: List hazardous substances that have or may have been stored, handled, or disposed at the site, based on your knowledge of site operations. Identify the sources to which the substances may be related. Summarize any existing analytical data concerning hazardous substances detected onsite, in releases from the site, or at targets.

GENERAL INFORMATION

Site Description and Operational History:

Probable Substances of Concern:
(Previous investigations, analytical data)

GENERAL INFORMATION (continued)

Site Sketch: Prepare a sketch of the site (freehand is acceptable). Indicate all pertinent features of the site and nearby environs, including: waste sources, buildings, residences, access roads, parking areas, drainage patterns, water bodies, vegetation, wells, sensitive environments, etc.

3

GENERAL INFORMATION (continued)

Site Sketch:
(Show all pertinent features, indicate sources and closest targets, indicate north)

SOURCE EVALUATION

- Number and name each source (e.g., 1. East Drum Storage Area, 2. Sludge Lagoon, 3. Battery Pile).
- Identify source type according to the list below.
- Describe the physical character of each source (e.g., dimensions, contents, waste types, containment, operating history).
- Show waste quantity (WQ) calculations for each source for appropriate tiers. Refer to instructions opposite page 5 and PA Tables 1a and 1b. Identify waste quantity tier and waste characteristics (WC) factor category score (for a site with a single source, according to PA Table 1a). Determine WC from PA Table 1b for the sum of source WQs for a multiple-source site.
- Attach additional sheets if necessary.
- Determine the site WC factor category score and record at the bottom of the page.

Source Type Descriptions

Landfill: an engineered (by excavation or construction) or natural hole in the ground into which wastes have been disposed by backfilling, or by contemporaneous soil deposition with waste disposal, covering wastes from view.

Surface Impoundment: a topographic depression, excavation, or diked area, primarily formed from earthen materials (lined or unlined) and designed to hold accumulated liquid wastes, wastes containing free liquids, or sludges that were not backfilled or otherwise covered during periods of deposition; depression may be dry if deposited liquid has evaporated, volatilized or leached, or wet with exposed liquid; structures that may be more specifically described as lagoon pond, aeration pit, settling pond, tailings pond, sludge pit, etc.; also a surface impoundment that has been covered with soil after the final deposition of waste materials (i.e., buried or backfilled).

Drums: portable containers designed to hold a standard 55-gallon volume of wastes.

Tanks and Non-Drum Containers: any stationary device, designed to contain accumulated wastes, constructed primarily of fabricated materials (such as wood, concrete, steel, or plastic) that provide structural support; any portable or mobile device in which waste is stored or otherwise handled.

Contaminated Soil: soil onto which available evidence indicates that a hazardous substance was spilled, spread, disposed, or deposited.

Pile: any non-containerized accumulation above the ground surface of solid, non-flowing wastes; includes open dumps. Some types of piles are: Chemical Waste Pile -- consists primarily of discarded chemical products, byproducts, radioactive wastes, or used or unused feedstocks; Scrap Metal or Junk Pile -- consists primarily of scrap metal or discarded durable goods such as appliances, automobiles, auto parts, or batteries, composed of materials suspected to contain or have contained a hazardous substance; Tailings Pile -- consists primarily of any combination of overburden from a mining operation and tailings from a mineral mining, beneficiation, or processing operation; Trash Pile -- consists primarily of paper, garbage, or discarded non-durable goods which are suspected to contain or have contained a hazardous substance.

Land Treatment: landfarming or other land treatment method of waste management in which liquid wastes or sludges are spread over land and tilled, or liquids are injected at shallow depths into soils.

Other: a source that does not fit any of the descriptions above; examples include contaminated building, ground water plume with no identifiable source, storm drain, dry well, and injection well.

SOURCE EVALUATION

Source No.:	Source Name:	Source Waste Quantity (WQ) Calculations:
Source Description:		

Source No.:	Source Name:	Source Waste Quantity (WQ) Calculations:
Source Description:		

Source No.:	Source Name:	Source Waste Quantity (WQ) Calculations:
Source Description:		
		Site WC:

WASTE CHARACTERISTICS (WC) SCORES

WC, based on waste quantity, may be determined by one or all of four measures called "tiers": constituent quantity, wastestream quantity, source volume, and source area. PA Table 1a (page 5) is divided into these four tiers. The amount and detail of information available determine which tier(s) to use for each source. For each source, evaluate waste quantity by as many of the tiers as you have information to support, and select the result that gives you the highest WC score. If minimal, incomplete, or no information is available regarding waste quantity, assign a WC score of 18 (minimum).

PA Table 1a has 6 columns: column 1 indicates the quantity tier; column 2 lists source types for the four tiers; columns 3, 4, and 5 provide ranges of waste amount for sites with only one source, which correspond to WC scores at the top of the columns (18, 32, or 100); column 6 provides formulas to obtain source waste quantity (WQ) values at sites with multiple sources.

To determine WC for sites with only one source:

1. *Identify source type (see descriptions opposite page 4).*
2. *Examine all waste quantity data available.*
3. *Estimate the mass and/or dimensions of the source.*
4. *Determine which quantity tiers to use based on available source information.*
5. *Convert source measurements to appropriate units for each tier you can evaluate for the source.*
6. *Identify the range into which the total quantity falls for each tier evaluated (PA Table 1a).*
7. *Determine the highest WC score obtained for any tier (18, 32, or 100, at top of PA Table 1a columns 3, 4, and 5, respectively).*
8. *Use this WC score for all pathways.*

To determine WC for sites with multiple sources:

1. *Identify each source type (see descriptions opposite page 4).*
2. *Examine all waste quantity data available for each source.*
3. *Estimate the mass and/or dimensions of each source.*
4. *Determine which quantity tiers to use for each source based on the available information.*
5. *Convert source measurements to appropriate units for each tier you can evaluate for each source.*
6. *For each source, use the formulas in column 6 of PA Table 1a to determine the WQ value for each tier that can be evaluated. The highest WQ value obtained for any tier is the WQ value for the source.*
7. *Sum the WQ values for all sources to get the site WQ total.*
8. *Use the site WQ total from step 7 to assign the WC score from PA Table 1b.*
9. *Use this WC score for all pathways.*

---

* The WC score is considered in all four pathways. However, if a primary target is identified for the ground water, surface water, or air migration pathway, assign the determined WC or a score of 32, whichever is greater, as the WC score for that pathway.

PA TABLE 1: WASTE CHARACTERISTICS (WC) SCORES

PA Table 1a: WC Scores for Single Source Sites and Formulas for Multiple Source Sites

TIER	SOURCE TYPE	SINGLE SOURCE SITES (assigned WC scores)			MULTIPLE SOURCE SITES
		WC = 18	WC = 32	WC = 100	Formula for Assigning Source WC Value
TOXICITY	N/A	≤100 lb	>100 to 10,000 lb	>10,000 lb	lb ÷ 1
WASTE	N/A	≤300,000 lb	>300,000 to 90 million lb	>90 million lb	lb ÷ 5,000
VOLUME	Landfill	≤6.75 million ft³ ≤250,000 yd³	>6.75 million to 675 million ft³ >250,000 to 25 million yd³	>675 million ft³ >25 million yd³	ft³ ÷ 67,500 yd³ ÷ 2,500
	Surface Impoundment	≤6,750 ft² ≤250 yd²	>6,750 to 675,000 ft² >250 to 25,000 yd²	>675,000 ft² >25,000 yd²	ft² ÷ 67.5 yd² ÷ 2.5
	Drums	≤1,000 drums	>1,000 to 100,000 drums	>100,000 drums	drums ÷ 10
	Tanks and non-drum containers	≤50,000 gallons	>50,000 to 5 million gallons	>5 million gallons	gallons ÷ 500
	Contaminated soil	≤6.75 million ft³ ≤250,000 yd³	>6.75 million to 675 million ft³ >250,000 to 25 million yd³	>675 million ft³ >25 million yd³	ft³ ÷ 67,500 yd³ ÷ 2,500
	Pile	≤6,750 ft² ≤250 yd²	>6,750 to 675,000 ft² >250 to 25,000 yd²	>675,000 ft² >25,000 yd²	ft² ÷ 67.5 yd² ÷ 2.5
	Other	≤6,750 ft² ≤250 yd²	>6,750 to 675,000 ft² >250 to 25,000 yd²	>675,000 ft² >25,000 yd²	ft² ÷ 67.5 yd² ÷ 2.5
AREA	Landfill	≤340,000 ft² ≤7.8 acres	>340,000 to 34 million ft² >7.8 to 780 acres	>34 million ft² >780 acres	ft² ÷ 3,400 acres ÷ 0.078
	Surface Impoundment	≤1,300 ft² ≤0.028 acres	>1,300 to 130,000 ft² >0.028 to 2.9 acres	>130,000 ft² >2.9 acres	ft² ÷ 13 acres ÷ 0.00029
	Contaminated soil	≤340 million ft² ≤7,800 acres	>340 million to 340 million ft² >7,800 to 7,800 acres	>340 million ft² >7,800 acres	ft² ÷ 34,000 acres ÷ 0.78
	Pile*	≤1,300 ft² ≤0.028 acres	>1,300 to 130,000 ft² >0.028 to 2.9 acres	>130,000 ft² >2.9 acres	ft² ÷ 13 acres ÷ 0.00029
	Land treatment	≤27,000 ft² ≤0.62 acres	>27,000 to 2.7 million ft² >0.62 to 62 acres	>2.7 million ft² >62 acres	ft² ÷ 270 acres ÷ 0.0062

1 ton = 2,000 lb = 1 yd³ = 4 drums = 200 gallons

* Use area of land surface under pile, not surface area of pile.

PA Table 1b: WC Scores for Multiple Source Sites

WC Total	WC Score
>0 to 100	18
>100 to 10,000	32
>10,000	100

GROUND WATER PATHWAY

Ground Water Use Description: Provide information on ground water use in the vicinity. Present the general stratigraphy, aquifers used, and distribution of private and municipal wells.

Calculations for Drinking Water Populations Served by Ground Water: Provide populations from private wells and municipal supply systems in each distance category. Show apportionment calculations for blended supply systems.

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GROUND WATER PATHWAY
GROUND WATER USE DESCRIPTION

Describe Ground Water Use Within 4-miles of the Site:
(Describe stratigraphy, information on aquifers, municipal and/or private wells)

Calculations for Drinking Water Populations Served by Ground Water:

GROUND WATER PATHWAY CRITERIA LIST

This "Criteria List" helps guide the process of developing hypotheses concerning the occurrence of a suspected release and the exposure of specific targets to a hazardous substance. The check-boxes record your professional judgment in evaluating these factors. Answers to all of the listed questions may not be available during the PA. Also, the list is not all-inclusive; if other criteria help shape your hypotheses, list them at the bottom of the page or attach an additional page.

The "Suspected Release" section identifies several site, source, and pathway conditions that could provide insight as to whether a release from the site is likely to have occurred. If a release is suspected, use the "Primary Targets" section to evaluate conditions that may help identify targets likely to be exposed to a hazardous substance. Record responses for the well that you feel has the highest probability of being exposed to a hazardous substance. You may use this section of the chart more than once, depending on the number of targets you feel may be considered "primary."

Check the boxes to indicate a "yes," "no," or "unknown" answer to each question. If you check the "Suspected Release" box as "yes," make sure you assign a Likelihood of Release value of 550 for the pathway.

GROUND WATER PATHWAY CRITERIA LIST

SUSPECTED RELEASE				PRIMARY TARGETS			
Yes	No	Unk		Yes	No	Unk	
☐	☐	☐	Are sources poorly contained?	☐	☐	☐	Is any drinking water well nearby?
☐	☐	☐	Is the source a type likely to contribute to ground water contamination (e.g., wet lagoon)?	☐	☐	☐	Has any nearby drinking water well been closed?
☐	☐	☐	Is waste quantity particularly large?	☐	☐	☐	Has any nearby drinking water user reported foul-tasting or foul-smelling water?
☐	☐	☐	Is precipitation heavy?	☐	☐	☐	Does any nearby well have a large drawdown or high production rate?
☐	☐	☐	Is the infiltration rate high?	☐	☐	☐	Is any drinking water well located between the site and other wells that are suspected to be exposed to a hazardous substance?
☐	☐		Is the site located in an area of karst terrain?	☐	☐	☐	Does analytical or circumstantial evidence suggest contamination at a drinking water well?
☐	☐	☐	Is the subsurface highly permeable or conductive?	☐	☐	☐	Does any drinking water well warrant sampling?
☐	☐	☐	Is drinking water drawn from a shallow aquifer?	☐	☐		Other criteria?_____
☐	☐	☐	Are suspected contaminants highly mobile in ground water?	☐	☐		PRIMARY TARGET(S) IDENTIFIED?
☐	☐	☐	Does analytical or circumstantial evidence suggest ground water contamination?				
☐	☐		Other criteria?_____				
☐	☐		SUSPECTED RELEASE?				
Summarize the rationale for Suspected Release (attach an additional page if necessary):				Summarize the rationale for Primary Targets (attach an additional page if necessary):			

GROUND WATER PATHWAY SCORESHEET

Pathway Characteristics

Answer the questions at the top of the page. Refer to the Ground Water Pathway Criteria List (page 7) to hypothesize whether you suspect that a hazardous substance associated with the site has been released to ground water. Record depth to aquifer (in feet): the difference between the deepest occurrence of a hazardous substance and the depth of the top of the shallowest aquifer at (or as near as possible) to the site. Note whether the site is in karst terrain (characterized by abrupt ridges, sink holes, caverns, springs, disappearing streams). Record the distance (in feet) from any source to the nearest well used for drinking water.

Likelihood of Release (LR)

1. Suspected Release: Hypothesize based on professional judgment guided by the Ground Water Pathway Criteria List (page 7). If you suspect a release to ground water, use only Column A for this pathway and do not evaluate factor 2.

2. No Suspected Release: If you do not suspect a release, determine score based on depth to aquifer or whether the site is in an area of karst terrain. If you do not suspect a release to ground water, use only Column B to score this pathway.

Targets (T)

This factor category evaluates the threat to populations obtaining drinking water from ground water. To apportion populations served by blended drinking water supply systems, determine the percentage of population served by each well based on its production.

3. Primary Target Population: Evaluate populations served by all drinking water wells that you suspect have been exposed to a hazardous substance released from the site. Use professional judgment guided by the Ground Water Pathway Criteria List (page 7) to make this determination. In the space provided, enter the population served by any wells you suspect have been exposed to a hazardous substance from the site. If only the number of residences is known, use the average county residents per household (rounded up to the next integer) to determine population served. Multiply the population by 10 to determine the Primary Target Population score. Note that if you do not suspect a release, there can be no primary target population.

4. Secondary Target Population: Evaluate populations served by all drinking water wells within 4 miles that you do not suspect have been exposed to a hazardous substance. Use PA Table 2a or 2b (for wells drawing from non-karst and karst aquifers, respectfully) (page 9). If only the number of residences is known, use the average county residents per household (rounded to the nearest integer) to determine population served. Circle the assigned value for the population in each distance category and enter it in the column on the far-right side of the table. Sum the far-right column and enter the total as the Secondary Target Population factor score.

5. Nearest Well represents the threat posed to the drinking water well that is most likely to be exposed to a hazardous substance. If you have identified a primary target population, enter 50. Otherwise, assign the score from PA Table 2a or 2b for the closest distance category with a drinking water well population.

6. Wellhead Protection Area (WHPA): WHPAs are special areas designated by States for protection under Section 1428 of the Safe Drinking Water Act. Local/State and EPA Regional water officials can provide information regarding the location of WHPAs.

7. Resources: A score of 5 can generally be assigned as a default measure. Assign zero only if ground water within 4 miles has no resource use.

Sum the target scores in Column A (Suspected Release) or Column B (No Suspected Release).

Waste Characteristics (WC)

8. Waste Characteristics: Score is assigned from page 4. However, if you have identified any primary target for ground water, assign either the score calculated on page 4 or a score of 32, whichever is greater.

Ground Water Pathway Score: Multiply the scores for LR, T, and WC. Divide the product by 82,500. Round the result to the nearest integer. If the result is greater than 100, assign 100.

GROUND WATER PATHWAY SCORESHEET

Pathway Characteristics	
Do you suspect a release (see Ground Water Pathway Criteria List, page 7)?	Yes ___ No ___
Is the site located in karst terrain?	Yes ___ No ___
Depth to aquifer:	___ ft
Distance to the nearest drinking water well:	___ ft

	A Suspected Release	B No Suspected Release	References
LIKELIHOOD OF RELEASE			
1. SUSPECTED RELEASE: If you suspect a release to ground water (see page 7), assign a score of 550. Use only column A for this pathway.	[550]		
2. NO SUSPECTED RELEASE: If you do not suspect a release to ground water, and the site is in karst terrain or the depth to aquifer is 70 feet or less, assign a score of 500; otherwise, assign a score of 340. Use only column B for this pathway.		[score = 340]	
LR =			
TARGETS			
3. PRIMARY TARGET POPULATION: Determine the number of people served by drinking water wells that you suspect have been exposed to a hazardous substance from the site (see Ground Water Pathway Criteria List, page 7). ___ people x 10 =			
4. SECONDARY TARGET POPULATION: Determine the number of people served by drinking water wells that you do NOT suspect have been exposed to a hazardous substance from the site, and assign the total population score from PA Table 2. Are any wells part of a blended system? Yes ___ No ___ If yes, attach a page to show apportionment calculations.			
5. NEAREST WELL: If you have identified a primary target population for ground water, assign a score of 50; otherwise, assign the Nearest Well score from PA Table 2. If no drinking water wells exist within 4 miles, assign a score of zero.	[50, 0, or 0]	[50, 0, or 0]	
6. WELLHEAD PROTECTION AREA (WHPA): If any source lies within or above a WHPA, or if you have identified any primary target well within a WHPA, assign a score of 20; assign 5 if neither condition holds but a WHPA is present within 4 miles; otherwise assign zero.	[20, 5, or 0]	[20, 5, or 0]	
7. RESOURCES	[0 or 0]	[0 or 0]	
T =			
WASTE CHARACTERISTICS			
8. A. If you have identified any primary target for ground water, assign the waste characteristics score calculated on page 4, or a score of 32, whichever is GREATER; do not evaluate part B of this factor.	[100 or 32]		
B. If you have NOT identified any primary target for ground water, assign the waste characteristics score calculated on page 4.		[100, 32, or 10]	
WC =			

GROUND WATER PATHWAY SCORE: $\frac{LR \times T \times WC}{82{,}500}$ [subject to a maximum of 100]

PA TABLE 2: VALUES FOR SECONDARY GROUND WATER TARGET POPULATIONS

PA Table 2a: Non-Karst Aquifers

Distance from Site	Population	Nearest Well (choose highest)	Population Served by Wells Within Distance Category: 1 to 10	11 to 30	31 to 100	101 to 300	301 to 1,000	1,001 to 3,000	3,001 to 10,000	10,001 to 30,000	30,001 to 100,000	Greater than 100,000	Population Value
0 to ¼ mile	_____	20	1	2	5	16	52	163	521	1,633	5,214	16,325	_____
> ¼ to ½ mile	_____	18	1	1	3	10	32	101	323	1,012	3,233	10,121	_____
> ½ to 1 mile	_____	9	1	1	2	5	17	52	167	522	1,668	5,224	_____
>1 to 2 miles	_____	5	1	1	1	3	9	29	94	294	939	2,938	_____
>2 to 3 miles	_____	3	1	1	1	2	7	21	68	212	678	2,122	_____
>3 to 4 miles	_____	2	1	1	1	1	4	13	42	131	417	1,306	_____
	Nearest Well =											Score =	

PA Table 2b: Karst Aquifers

Distance from Site	Population	Nearest Well (use 20 for karst)	Population Served by Wells Within Distance Category: 1 to 10	11 to 30	31 to 100	101 to 300	301 to 1,000	1,001 to 3,000	3,001 to 10,000	10,001 to 30,000	30,001 to 100,000	Greater than 100,000	Population Value
0 to ¼ mile	_____	20	1	2	5	16	52	163	521	1,633	5,214	16,325	_____
> ¼ to ½ mile	_____	20	1	1	3	10	32	101	323	1,012	3,233	10,121	_____
> ½ to 1 mile	_____	20	1	1	3	8	26	82	261	816	2,607	8,162	_____
>1 to 2 miles	_____	20	1	1	3	8	26	82	261	816	2,607	8,162	_____
>2 to 3 miles	_____	20	1	1	3	8	26	82	261	816	2,607	8,162	_____
>3 to 4 miles	_____	20	1	1	3	8	26	82	261	816	2,607	8,162	_____
	Nearest Well =											Score =	

SURFACE WATER PATHWAY
MIGRATION ROUTE SKETCH

Suface Water Migration Route Sketch:
(include runoff route, probable point of entry, 15-mile target distance limit, intakes, fisheries, and sensitive environments).

Migration Route Sketch: Sketch the surface water migration pathway (freehand is acceptable) illustrating the drainage route and identifying water bodies, probable point of entry, flows, and targets.

SURFACE WATER PATHWAY CRITERIA LIST

This "Criteria List" helps guide the process of developing hypotheses concerning the occurrence of a suspected release and the exposure of specific targets to a hazardous substance. The check-boxes record your professional judgment in evaluating these factors. Answers to all of the listed questions may not be available during the PA. Also, the list is not all-inclusive; if other criteria help shape your hypotheses, list them at the bottom of the page or attach an additional page.

The "Suspected Release" section identifies several site, source, and pathway conditions that could provide insight as to whether a release from the site is likely to have occurred. If a release is suspected, use the "Primary Targets" section to guide you through evaluation of some conditions that may help identify targets likely to be exposed to a hazardous substance. Record responses for the target that you feel has the highest probability of being exposed to a hazardous substance. You may use this section of the chart more than once, depending on the number of targets you feel may be considered "primary."

Check the boxes to indicate a "yes," "no," or "unknown" answer to each question. If you check the "Suspected Release" box as "yes," make sure you assign a Likelihood of Release value of 550 for the pathway.

If the distance to surface water is greater than 2 miles, do not evaluate the surface water migration pathway. Document the source of information in the text boxes below the surface water criteria list.

SURFACE WATER PATHWAY CRITERIA LIST

SUSPECTED RELEASE				*PRIMARY TARGETS*			
Yes	No	Unk		Yes	No	Unk	
☐	☐	☐	Is surface water nearby?	☐	☐	☐	Is any target nearby? If yes: ☐ Drinking water intake ☐ Fishery ☐ Sensitive environment
☐	☐	☐	Is waste quantity particularly large?	☐	☐	☐	Has any intake, fishery, or recreational area been closed?
☐	☐	☐	Is the drainage area large?	☐	☐	☐	Does analytical or circumstantial evidence suggest surface water contamination at or downstream of a target?
☐	☐	☐	Is rainfall heavy?	☐	☐	☐	Does any target warrant sampling? If yes: ☐ Drinking water intake ☐ Fishery ☐ Sensitive environment
☐	☐	☐	Is the infiltration rate low?	☐	☐		Other criteria?_____
☐	☐	☐	Are sources poorly contained or prone to runoff or flooding?	☐	☐		PRIMARY INTAKE(S) IDENTIFIED?
☐	☐	☐	Is a runoff route well defined (e.g., ditch or channel leading to surface water)?	☐	☐		PRIMARY FISHERY(IES) IDENTIFIED?
☐	☐	☐	Is vegetation stressed along the probable run-off route?	☐	☐		PRIMARY SENSITIVE ENVIRONMENT(S) IDENTIFIED?
☐	☐	☐	Are sediments or water unnaturally discolored?				
☐	☐	☐	Is wildlife unnaturally absent?				
☐	☐	☐	Has deposition of waste into surface water been observed?				
☐	☐	☐	Is ground water discharge to surface water likely?				
☐	☐	☐	Does analytical or circumstantial evidence suggest surface water contamination?				
☐	☐		Other criteria?_____				
☐	☐		SUSPECTED RELEASE?				
Summarize the rationale for Suspected Release (attach an additional page if necessary):				Summarize the rationale for Primary Targets (attach an additional page if necessary):			

SURFACE WATER PATHWAY LIKELIHOOD OF RELEASE AND DRINKING WATER THREAT SCORESHEET

Pathway Characteristics

The surface water pathway includes three threats: Drinking Water Threat, Human Food Chain Threat, and Environmental Threat. Answer the questions at the top of the page. Refer to the Surface Water Pathway Criteria List (page 11) to hypothesize whether you suspect that a hazardous substance associated with the site has been released to surface water. Record the distance to surface water (the shortest overland drainage distance from a source to a surface water body). Record the flood frequency at the site (e.g., 100-yr, 200-yr). If the site is located in more than one floodplain, use the most frequent flooding event. Identify surface water use(s) along the surface water migration path and their distance(s) from the site.

Likelihood of Release (LR)

1. Suspected Release: Hypothesize based on professional judgment guided by the Surface Water Pathway Criteria List (page 11). If you suspect a release to surface water, use only Column A for this pathway and do not evaluate factor

2. No Suspected Release: If you do not suspect a release, determine score based on the shortest overland drainage distance from a source to a surface water body. If distance to surface water is 2,500 feet or less, assign a score of 500. If distance to surface water is greater than 2,500 feet, determine score based on flood frequency. If you do not suspect a release to surface water, use only Column B to score this pathway.

Drinking Water Threat Targets (T)

3. List all drinking water intakes on downstream surface water bodies along the surface water migration path. Record the intake name, the type of water body on which the intake is located, the flow of the water body, and the number of people served by the intake (apportion the population if part of a blended system).

4. Primary Target Population: Evaluate populations served by all drinking water intakes that you suspect have been exposed to a hazardous substance released from the site. Use professional judgment guided by the Surface Water Pathway Criteria List (page 11) to make this determination. In the space provided, enter the population served by all intakes you suspect have been exposed to a hazardous substance from the site. If only the number of residences is known, use the average county residents per household (rounded up to the next integer) to determine population served. Multiply by 10 to determine the Primary Target Population score. Remember, if you do not suspect a release, there can be no primary target population.

5. Secondary Target Population: Evaluate populations served by all drinking water intakes within the target distance limit that you do not suspect have been exposed to a hazardous substance. Use PA Table 3 (page 13) and enter the population served by intakes for each flow category. If only the number of residences is known, use the average county residents per household (rounded to the nearest integer) to determine population served. Circle the assigned value for the population in each flow category and enter it in the column on the far-right side of the table. Sum the far-right column and enter the total as the Secondary Target Population factor score.

Gauging station data for many surface water bodies are available from USGS or other sources. In the absence of gauging station data, estimate flow using the list of surface water body types and associated flow categories in PA Table 4 (page 13). The flow for lakes is determined by the sum of flows of streams entering or leaving the lake. Note that the flow category "mixing zone of quiet flowing rivers" is limited to 3 miles from the probable point of entry.

6. Nearest Intake represents the threat posed to the drinking water intake that is most likely to be exposed to a hazardous substance. If you have identified a primary target population, enter 50. Otherwise, assign the score from PA Table 3 (page 13) for the lowest-flowing water body on which there is an intake.

7. Resources: A score of 5 can generally be assigned as a default measure. Assign zero only if surface water within the target distance limit has no resource use.

Sum the target scores in Column A (Suspected Release) or Column B (No Suspected Release).

SURFACE WATER PATHWAY
LIKELIHOOD OF RELEASE AND DRINKING WATER THREAT SCORESHEET

Pathway Characteristics

Do you suspect a release (see Surface Water Pathway Criteria List, page 11)? Yes ___ No ___
Distance to surface water: _____ ft
Flood frequency: _____ yrs
What is the downstream distance to the nearest drinking water intake? _____ miles
Nearest fishery? _____ miles Nearest sensitive environment? _____ miles

LIKELIHOOD OF RELEASE	A Suspected Release	B No Suspected Release	Reference
1. SUSPECTED RELEASE: If you suspect a release to surface water (see page 11), assign a score of 550. Use only column A for this pathway.	550		
2. NO SUSPECTED RELEASE: If you do not suspect a release to surface water, use the table below to assign a score based on distance to surface water and flood frequency. Use only column B for this pathway.			
Distance to surface water ≤ 2,500 feet		500	
Distance to surface water > 2,500 feet, and			
Site in annual or 10-year floodplain		500	
Site in 100-year floodplain		400	
Site in 500-year floodplain		300	
Site outside 500-year floodplain		100	
LR =			

DRINKING WATER THREAT TARGETS					
3. Record the water body type, flow (if applicable), and number of people served by each drinking water intake within the target distance limit. If there is no drinking water intake within the target distance limit, factors 4, 5, and 8 each receive zero scores.					
Intake Name	Water Body Type	Flow	People Served		
		____ cfs			
		____ cfs			
		____ cfs			
4. PRIMARY TARGET POPULATION: If you suspect any drinking water intake listed above has been exposed to a hazardous substance from the site (see Surface Water Pathway Criteria List, page 11), list the intake name(s) and calculate the factor score based on the total population served.					
____ people x 10 =					
5. SECONDARY TARGET POPULATION: Determine the number of people served by drinking water intakes that you do NOT suspect have been exposed to a hazardous substance from the site, and assign the total population score from PA Table 3.					
Are any intakes part of a blended system? Yes ___ No ___ If yes, attach a page to show apportionment calculations.					
6. NEAREST INTAKE: If you have identified a primary target population for the drinking water threat (factor 4), assign a score of 50; otherwise, assign the Nearest Intake score from PA Table 3. If no drinking water intake exists within the target distance limit, assign a score of zero.					
7. RESOURCES					
T =					

SURFACE WATER PATHWAY HUMAN FOOD CHAIN THREAT SCORESHEET

Likelihood of Release (LR)

LR is the same for all surface water pathway threats. Enter LR score from page 12.

Human Food Chain Threat Targets (T)

8. The only human food chain targets are fisheries. A fishery is an area of a surface water body from which food chain organisms are taken or could be taken for human consumption on a subsistence, sporting, or commercial basis. Food chain organisms include fish, shellfish, crustaceans, amphibians, and amphibious reptiles. Fisheries are delineated by changes in surface water body type (i.e., streams and rivers, lakes, coastal tidal waters, and oceans/Great Lakes) and whenever the flow characteristics of a stream or river change.

In the space provided, identify all fisheries within the target distance limit. Indicate the surface water body type and flow for each fishery. Gauging station flow data are available for many surface water bodies from USGS or other sources. In the absence of gauging station data, estimate flow using the list of surface water body types and associated flow categories in PA Table 4 (page 13). The flow for lakes is determined by the sum of flows of streams entering or leaving the lake. Note that, if there are no fisheries within the target distance limit, the Human Food Chain Threat Targets score is zero.

9. Primary fisheries are any fisheries within the target distance limit that you suspect have been exposed to a hazardous substance released from the site. Use professional judgment guided by the Surface Water Pathway Criteria List (page 11) to make this determination. If you identify any primary fisheries, list them in the space provided, enter 300 as the Primary Fisheries factor score, and do not evaluate Secondary Fisheries. Note that if you do not suspect a release, there can be no primary fisheries.

10. Secondary fisheries are fisheries that you do not suspect have been exposed to a hazardous substance. Evaluate this factor only if fisheries are present within the target distance limit, but none is considered a primary fishery.

A. If you suspect a release to surface water and have identified a secondary fishery but no primary fishery, assign a score of 210.

B. If you do not suspect a release, evaluate this factor based on flow. In the absence of gauging station flow data, estimate flow using the list of surface water body types and associated flow categories in PA Table 4 (page 13). Assign a Secondary Fisheries score from the table on the scoresheet using the lowest flow at any fishery within the target distance limit. (Dilution weight multiplier does not apply to PA evaluation of this factor.)

Sum the target scores in Column A (Suspected Release) or Column B (No Suspected Release).

PA TABLE 3: VALUES FOR SECONDARY SURFACE WATER TARGET POPULATIONS

Surface Water Body Flow (see PA Table 4)	Population	Nearest Intake (choose highest)	Population Served by Intakes Within Distance Category: 1 to 10	11 to 100	101 to 300	301 to 1,000	1,001 to 3,000	3,001 to 10,000	10,001 to 30,000	30,001 to 100,000	100,001 to 300,000	300,001 to 1,000,000	Greater than 1,000,000	Population Value
<10 cfs	____	20	2	5	18	52	163	521	1,633	5,214	16,325	52,136	163,246	____
10 to 100 cfs	____	2	1	1	2	5	16	52	163	521	1,633	5,214	16,325	____
>100 to 1,000 cfs	____	1	0	0	1	1	2	5	16	52	163	521	1,633	____
>1,000 to 10,000 cfs	____	0	0	0	0	0	1	1	2	5	16	52	163	____
>10,000 cfs or Great Lakes	____	0	0	0	0	0	0	0	1	1	2	5	16	____
3-mile Mixing Zone	____	10	1	3	8	26	82	261	816	2,607	8,162	26,068	81,663	____
		Nearest Intake =											Score =	

PA TABLE 4: SURFACE WATER TYPE / FLOW CHARACTERISTICS
WITH DILUTION WEIGHTS FOR SECONDARY SURFACE WATER SENSITIVE ENVIRONMENTS

TYPE OF Surface Water Body: Water Body Type	TYPE OF Surface Water Body: OR FLOW	Dilution Weight
minimal stream	<10 cfs	1
small to moderate stream	10 to 100 cfs	0.1
moderate to large stream	>100 to 1,000 cfs	N/A
large stream to river	1,000 to 10,000 cfs	N/A
large river	>10,000 cfs	N/A
3-mile mixing zone of quiet flowing streams or rivers	10 cfs or greater	N/A
coastal tidal water (harbors, sounds, bays, etc.), ocean, or Great Lakes	N/A	N/A

SURFACE WATER PATHWAY (continued)
HUMAN FOOD CHAIN THREAT SCORESHEET

LIKELIHOOD OF RELEASE		A Suspected Release	B No Suspected Release	References
Enter Surface Water Likelihood of Release score from page 12.	LR =			

HUMAN FOOD CHAIN THREAT TARGETS

8. Record the water body type and flow (if applicable) for each fishery within the target distance limit. If there is no fishery within the target distance limit, assign a Targets score of 0 at the bottom of the page.

Fishery Name	Water Body Type	Flow
		cfs
		cfs
		cfs
		cfs
		cfs

9. PRIMARY FISHERIES: If you suspect any fishery listed above has been exposed to a hazardous substance from the site (see Surface Water Criteria List, page 11), assign a score of 300 and do not evaluate Factor 10. List the primary fisheries:

_____, _____,
_____, _____.

10. SECONDARY FISHERIES

A. If you suspect a release to surface water and have identified a secondary fishery but no primary fishery, assign a score of 210.

B. If you do not suspect a release, assign a Secondary Fisheries score from the table below using the lowest flow at any fishery within the target distance limit.

Lowest Flow	Secondary Fisheries Score
< 10 cfs	210
10 to 100 cfs	30
> 100 cfs, coastal tidal waters, oceans, or Great Lakes	12

T =

SURFACE WATER PATHWAY ENVIRONMENTAL THREAT SCORESHEET

Likelihood of Release (LR)

LR is the same for all surface water pathway threats. Enter LR score from page 12.

Environmental Threat Targets (T)

11. PA Table 5 (page 16) lists sensitive environments for the Surface Water Pathway Environmental Threat. In the space provided, identify all sensitive environments located within the target distance limit. Indicate the surface water body type and flow at each sensitive environment. Gauging station flow data for many surface water bodies are available from USGS or other sources. In the absence of gauging station data, estimate flow using the list of surface water body types and associated flow categories in PA Table 4 (page 13). The flow for lakes is determined by the sum of flows of streams entering or leaving the lake. Note that if there are no sensitive environments within the target distance limit, the Environmental Threat Targets score is zero.

12. Primary sensitive environments are surface water sensitive environments within the target distance limit that you suspect have been exposed to a hazardous substance released from the site. Use professional judgment guided by the Surface Water Pathway Criteria List (page 11) to make this determination. If you identify any primary sensitive environments, list them in the space provided, enter 300 as the Primary Sensitive Environments factor score, and do not evaluate Secondary Sensitive Environments. Note that if you do not suspect a release, there can be no primary sensitive environments.

13. Secondary sensitive environments are surface water sensitive environments that you do not suspect have been exposed to a hazardous substance. Evaluate this factor only if surface water sensitive environments are present within the target distance limit, but none is considered a primary sensitive environment. Evaluate secondary sensitive environments based on flow.

- In the table provided, list all secondary sensitive environments on surface water bodies with flow of 100 cfs or less.
  1) Use PA Table 4 (page 13) to determine the appropriate dilution weight for each.
  2) Use PA Tables 5 and 6 (page 16) to determine the appropriate value for each sensitive environment type and for wetlands frontage.
  3) For a sensitive environment that falls into more than one of the categories in PA Table 5, sum the values for each type to determine the environment value (e.g., a wetland with 1.5 miles frontage (value of 50) that is also a critical habitat for a Federally designated endangered species (value of 100) would receive a total value of 150).
  4) For each sensitive environment, multiply the dilution weight by the environment type (or length of wetlands) value and record the product in the far-right column.
  5) Sum the values in the far-right, column and enter the total as the Secondary Sensitive Environments score. Do not evaluate part B of this factor.
- If all secondary sensitive environments are on surface water bodies with flows greater than 100 cfs, assign 10 as the Secondary Sensitive Environments score.

Sum the target scores in Column A (Suspected Release) or Column B (No Suspected Release).

SURFACE WATER PATHWAY (continued)
ENVIRONMENTAL THREAT SCORESHEET

LIKELIHOOD OF RELEASE		A: Suspected Release	B: No Suspected Release	References
		[illegible]	[illegible]	
Enter Surface Water Likelihood of Release score from page 12.	LR =			

ENVIRONMENTAL THREAT TARGETS

11. Record the water body type and flow (if applicable) for each surface water sensitive environment within the target distance limit (see PA Tables 4 and 5). If there is no sensitive environment within the target distance limit, assign a Targets score of 0 at the bottom of the page.

Environment Name	*Water Body Type*	*Flow*
____	____	____ cfs
____	____	____ cfs
____	____	____ cfs
____	____	____ cfs
____	____	____ cfs

12. PRIMARY SENSITIVE ENVIRONMENTS: If you suspect any sensitive environment listed above has been exposed to a hazardous substance from the site (see Surface Water Criteria List, page 11), assign a score of 300 and do not evaluate factor 13. List the primary sensitive environments:

____________________ , ____________________
____________________ , ____________________

13. SECONDARY SENSITIVE ENVIRONMENTS: If sensitive environments are present, but none is a primary sensitive environment, evaluate Secondary Sensitive Environments based on flow.

A. For secondary sensitive environments on surface water bodies with flows of 100 cfs or less, assign scores as follows, and do not evaluate part B of this factor:

Flow	*Dilution Weight (PA Table 4)*		*Environment Type and Value (PA Tables 5 and 6)*		*Total*
cfs		x		=	
cfs		x		=	
cfs		x		=	
cfs		x		=	
cfs		x		=	

Sum =

B. If all secondary sensitive environments are located on surface water bodies with flows > 100 cfs, assign a score of 10.

T =

PA TABLE 5: SURFACE WATER AND AIR PATHWAY SENSITIVE ENVIRONMENTS VALUES

Sensitive Environment	*Assigned Value*
Critical habitat for Federally designated endangered or threatened species Marine Sanctuary National Park Designated Federal Wilderness Area Ecologically important areas identified under the Coastal Zone Wilderness Act Sensitive Areas identified under the National Estuary Program or Near Coastal Water Program of the Clean Water Act Critical Areas identified under the Clean Lakes Program of the Clean Water Act (subareas in lakes or entire small lakes) National Monument (air pathway only) National Seashore Recreation Area National Lakeshore Recreation Area	100
Habitat known to be used by Federally designated or proposed endangered or threatened species National Preserve National or State Wildlife Refuge Unit of Coastal Barrier Resources System Federal land designated for the protection of natural ecosystems Administratively Proposed Federal Wilderness Area Spawning areas critical for the maintenance of fish/shellfish species within a river system, bay, or estuary Migratory pathways and feeding areas critical for the maintenance of anadromous fish species in a river system Terrestrial areas utilized for breeding by large or dense aggregations of vertebrate animals (air pathway) or semi-aquatic foragers (surface water pathway) National river reach designated as Recreational	75
Habitat known to be used by State designated endangered or threatened species Habitat known to be used by a species under review as to its Federal endangered or threatened status Coastal Barrier (partially developed) Federally designated Scenic or Wild River	50
State land designated for wildlife or game management State designated Scenic or Wild River State designated Natural Area Particular areas, relatively small in size, important to maintenance of unique biotic communities	25
State designated areas for protection/maintenance of aquatic life under the Clean Water Act	5
Wetlands	See PA Table 6 (Surface Water Pathway) or PA Table 9 (Air Pathway)

PA TABLE 6: SURFACE WATER PATHWAY WETLANDS FRONTAGE VALUES

Total Length of Wetlands	*Assigned Value*
Less than 0.1 mile	0
0.1 to 1 mile	25
Greater than 1 to 2 miles	50
Greater than 2 to 3 miles	75
Greater than 3 to 4 miles	100
Greater than 4 to 8 miles	150
Greater than 8 to 12 miles	250
Greater than 12 to 16 miles	350
Greater than 16 to 20 miles	450
Greater than 20 miles	500

SURFACE WATER PATHWAY WASTE CHARACTERISTICS, THREAT, AND PATHWAY SCORES

Waste Characteristics (WC)

14. **Waste Characteristics:** Score is assigned from page 4. However, if a primary target has been identified for any surface water threat, assign either the score calculated on page 4 or a score of 32, whichever is greater.

Surface Water Pathway Threat Scores

Fill in the matrix with the appropriate scores from the previous pages. To calculate the score for each threat: multiply the scores for LR, T, and WC; divide the product by 82,500; and round the result to the nearest integer. The Drinking Water Threat and Human Food Chain Threat are each subject to a maximum of 100. The Environmental Threat is subject to a maximum of 60. Enter the rounded threat scores in the far-right column.

Surface Water Pathway Score

Sum the individual threat scores to determine the Surface Water Pathway Score. If the sum is greater than 100, assign 100.

SURFACE WATER PATHWAY (concluded)
WASTE CHARACTERISTICS, THREAT, AND PATHWAY SCORE SUMMARY

WASTE CHARACTERISTICS	A *Suspected Release*	B *No Suspected Release*
14. A. If you have identified any primary target for surface water (pages 12, 14, or 15), assign the waste characteristics score calculated on page 4, or a score of 32, whichever is GREATER; do not evaluate part B of this factor.	[100 = 32]	
B. If you have NOT identified any primary target for surface water, assign the waste characteristics score calculated on page 4.	[100/32, = 1X]	[100/32, = 1X]
WC =		

SURFACE WATER PATHWAY THREAT SCORES

Threat	*Likelihood of Release (LR) Score (from page 12)*	*Targets (T) Score (pages 12, 14, 15)*	*Pathway Waste Characteristics (WC) Score (determined above)*	*Threat Score LR x T x WC / 82,500*
Drinking Water				[subject to a maximum of 100]
Human Food Chain				[subject to a maximum of 100]
Environmental				[subject to a maximum of 60]

SURFACE WATER PATHWAY SCORE
(Drinking Water Threat + Human Food Chain Threat + Environmental Threat)

[subject to a maximum of 100]

SOIL EXPOSURE PATHWAY CRITERIA LIST

Areas of surficial contamination can generally be assumed. This "Criteria List" helps guide the process of developing a hypothesis concerning the exposure of specific targets to a hazardous substance at the site. Use the "Resident Population" section to evaluate site and source conditions that may help identify targets likely to be exposed to a hazardous substance. The check-boxes record your professional judgment. Answers to all of the listed questions may not be available during the PA. Also, the list is not all-inclusive; if other criteria help shape your hypothesis, list them at the bottom of the page or attach an additional page.

Check the boxes to indicate a "yes," "no," or "unknown" answer to each question.

SOIL EXPOSURE PATHWAY CRITERIA LIST	
SUSPECTED CONTAMINATION	*RESIDENT POPULATION*
Surficial contamination can generally be assumed.	Yes / No / Unk ☐ ☐ ☐ Is any residence, school, or daycare facility on or within 200 feet of an area of suspected contamination? ☐ ☐ ☐ Is any residence, school, or daycare facility located on adjacent land previously owned or leased by the site owner/operator? ☐ ☐ ☐ Is there a migration route that might spread hazardous substances near residences, schools, or daycare facilities? ☐ ☐ ☐ Have onsite or adjacent residents or students reported adverse health effects, exclusive of apparent drinking water or air contamination problems? ☐ ☐ ☐ Does any neighboring property warrant sampling? ☐ ☐ Other criteria?_____ ☐ ☐ RESIDENT POPULATION IDENTIFIED?
Summarize the rationale for Resident Population (attach an additional page if necessary):	

SOIL EXPOSURE PATHWAY SCORESHEET

Pathway Characteristics

Answer the questions at the top of the page. Identify people who may be exposed to a hazardous substance because they work at the facility, or reside or attend school or daycare on or within 200 feet of an area of suspected contamination. If the site is active, estimate the number of full and part-time workers. Note that evaluation of targets is based on current site conditions.

Likelihood of Exposure (LE)

1. **Suspected Contamination:** Areas of surficial contamination are present at most sites, and a score of 550 can generally be assigned as a default measure. Assign zero, which effectively eliminates the pathway from further consideration, only if there is no surficial contamination; reliable analytical data are generally necessary to make this determination.

Resident Population Threat Targets (T)

2. **Resident Population** corresponds to "primary targets" for the migration pathways. Use professional judgment guided by the Soil Exposure Pathway Criteria List (page 18) to determine if there are people living or attending school or daycare on or within 200 feet of areas of suspected contamination. Record the number of people identified asresident population and multiply by 10 to determine the Resident Population factor score.

3. **Resident Individual:** Assign 50 if you have identified a resident population; otherwise, assign zero.

4. **Workers:** Estimate the number of full and part-time workers at this facility and adjacent facilities where contamination is also suspected. Assign a score for the Workers factor from the table.

5. **Terrestrial Sensitive Environments:** In the table provided, list each terrestrial sensitive environment located on an area of suspected contamination. Use PA Table 7 (page 20) to assign a value for each. Sum the values and assign the total as the factor score.

6. **Resources:** A score of 5 can generally be assigned as a default measure. Assign zero only if there is no land resource use on an area of suspected contamination.

Sum the target scores.

Waste Characteristics (WC)

7. Enter the WC score determined on page 4.

Resident Population Threat Score: Multiply the scores for LE, T, and WC. Divide the product by 82,500. Round the result to the nearest integer. If the result is greater than 100, assign 100.

Nearby Population Threat Score: Do not evaluate this threat if you gave a zero score to Likelihood of Exposure. Otherwise, assign a score based on the population within a 1-mile radius (use the same 1-mile radius population you evaluate for air pathway population targets):

Population Within One Mile	Nearby Population Threat Score
< 10, 000	1
10,000 to 50,000	2
> 50,000	4

Soil Exposure Pathway Score: Sum the Resident Population Threat score and the Nearby Population Threat score, subject to a maximum of 100.

SOIL EXPOSURE PATHWAY SCORESHEET

Pathway Characteristics

Do any people live on or within 200 ft of areas of suspected contamination? Yes ___ No ___

Do any people attend school or daycare on or within 200 ft of areas of suspected contamination? Yes ___ No ___

Is the facility active? Yes ___ No ___ If yes, estimate the number of workers: _____

	Suspected Contamination	*References*
LIKELIHOOD OF EXPOSURE		
1. SUSPECTED CONTAMINATION: Surficial contamination can generally be assumed, and a score of 550 assigned. Assign zero only if the absence of surficial contamination can be confidently demonstrated. LE =		
RESIDENT POPULATION THREAT TARGETS		
2. RESIDENT POPULATION: Determine the number of people occupying residences or attending school or daycare on or within 200 feet of areas of suspected contamination (see Soil Exposure Pathway Criteria List, page 18). _____ people x 10 =		
3. RESIDENT INDIVIDUAL: If you have identified a resident population (factor 2), assign a score of 50; otherwise, assign a score of 0.		
4. WORKERS: Use the following table to assign a score based on the total number of workers at the facility and nearby facilities with suspected contamination:		
5. TERRESTRIAL SENSITIVE ENVIRONMENTS: Use PA Table 7 to assign a value for each terrestrial sensitive environment on an area of suspected contamination:		
6. RESOURCES		
T =		
WASTE CHARACTERISTICS		
7. Assign the waste characteristics score calculated on page 4. WC =		
RESIDENT POPULATION THREAT SCORE: LE X T X WC / 82,500.		
NEARBY POPULATION THREAT SCORE:		
SOIL EXPOSURE PATHWAY SCORE: Resident Population Threat + Nearby Population Threat		

Number of Workers	*Score*
0	0
1 to 100	5
101 to 1,000	10
> 1,000	15

Terrestrial Sensitive Environment Type	*Value*

Sum =

SOIL EXPOSURE PATHWAY SCORESHEET

Pathway Characteristics

Answer the questions at the top of the page. Identify people who may be exposed to a hazardous substance because they work at the facility, or reside or attend school or daycare on or within 200 feet of an area of suspected contamination. If the site is active, estimate the number of full and part-time workers. Note that evaluation of targets is based on current site conditions.

Likelihood of Exposure (LE)

1. **Suspected Contamination:** Areas of surficial contamination are present at most sites, and a score of 550 can generally be assigned as a default measure. Assign zero, which effectively eliminates the pathway from further consideration, only if there is no surficial contamination; reliable analytical data are generally necessary to make this determination.

Resident Population Threat Targets (T)

2. **Resident Population** corresponds to "primary targets" for the migration pathways. Use professional judgment guided by the Soil Exposure Pathway Criteria List (page 18) to determine if there are people living or attending school or daycare on or within 200 feet of areas of suspected contamination. Record the number of people identified asresident population and multiply by 10 to determine the Resident Population factor score.

3. **Resident Individual:** Assign 50 if you have identified a resident population; otherwise, assign zero.

4. **Workers:** Estimate the number of full and part-time workers at this facility and adjacent facilities where contamination is also suspected. Assign a score for the Workers factor from the table.

5. **Terrestrial Sensitive Environments:** In the table provided, list each terrestrial sensitive environment located on an area of suspected contamination. Use PA Table 7 (page 20) to assign a value for each. Sum the values and assign the total as the factor score.

6. **Resources:** A score of 5 can generally be assigned as a default measure. Assign zero only if there is no land resource use on an area of suspected contamination.

Sum the target scores.

Waste Characteristics (WC)

7. Enter the WC score determined on page 4.

Resident Population Threat Score: Multiply the scores for LE, T, and WC. Divide the product by 82,500. Round the result to the nearest integer. If the result is greater than 100, assign 100.

Nearby Population Threat Score: Do not evaluate this threat if you gave a zero score to Likelihood of Exposure. Otherwise, assign a score based on the population within a 1-mile radius (use the same 1-mile radius population you evaluate for air pathway population targets):

Population Within One Mile	Nearby Population Threat Score
< 10, 000	1
10,000 to 50,000	2
> 50,000	4

Soil Exposure Pathway Score: Sum the Resident Population Threat score and the Nearby Population Threat score, subject to a maximum of 100.

SOIL EXPOSURE PATHWAY SCORESHEET

Pathway Characteristics

Do any people live on or within 200 ft of areas of suspected contamination? Yes ___ No ___

Do any people attend school or daycare on or within 200 ft of areas of suspected contamination? Yes ___ No ___

Is the facility active? Yes ___ No ___ If yes, estimate the number of workers: _____

LIKELIHOOD OF EXPOSURE	*Suspected Contamination*	*References*
1. SUSPECTED CONTAMINATION: Surficial contamination can generally be assumed, and a score of 550 assigned. Assign zero only if the absence of surficial contamination can be confidently demonstrated. LE =		

RESIDENT POPULATION THREAT TARGETS		
2. RESIDENT POPULATION: Determine the number of people occupying residences or attending school or daycare on or within 200 feet of areas of suspected contamination (see Soil Exposure Pathway Criteria List, page 18). _____ people x 10 =		
3. RESIDENT INDIVIDUAL: If you have identified a resident population (factor 2), assign a score of 50; otherwise, assign a score of 0.		
4. WORKERS: Use the following table to assign a score based on the total number of workers at the facility and nearby facilities with suspected contamination:		

Number of Workers	*Score*
0	0
1 to 100	5
101 to 1,000	10
> 1,000	15

5. TERRESTRIAL SENSITIVE ENVIRONMENTS: Use PA Table 7 to assign a value for each terrestrial sensitive environment on an area of suspected contamination:		

Terrestrial Sensitive Environment Type	*Value*

Sum =

6. RESOURCES		
T =		

WASTE CHARACTERISTICS		
7. Assign the waste characteristics score calculated on page 4. WC =		

RESIDENT POPULATION THREAT SCORE: $\frac{LE \times T \times WC}{82,500.}$

NEARBY POPULATION THREAT SCORE:

SOIL EXPOSURE PATHWAY SCORE:
Resident Population Threat + Nearby Population Threat

AIR PATHWAY CRITERIA LIST

SUSPECTED RELEASE				PRIMARY TARGETS
Yes	No	Unk		
☐	☐	☐	Are odors currently reported?	If you suspect a release to air, evaluate all populations and sensitive environments within 1/4 mile (including those onsite) as primary targets.
☐	☐	☐	Has release of a hazardous substance to the air been directly observed?	
☐	☐	☐	Are there reports of adverse health effects (e.g., headaches, nausea, dizziness) potentially resulting from migration of hazardous substances through the air?	
☐	☐	☐	Does analytical or circumstantial evidence suggest a release to the air?	
☐	☐		Other criteria?_____	
☐	☐		SUSPECTED RELEASE?	

Summarize the rationale for Suspected Release (attach an additional page if necessary):

AIR PATHWAY SCORESHEET

Pathway Characteristics

Answer the questions at the top of the page. Refer to the Air Pathway Criteria List (page 21) to hypothesize whether you suspect that a hazardous substance release to the air could be detected. Due to dispersion, releases to air are not as persistent as releases to water migration pathways and are much more difficult to detect. Develop your hypothesis concerning the release of hazardous substances to air based on "real time" considerations. Record the distance (in feet) from any source to the nearest regularly occupied building.

Likelihood of Release (LR)

1. Suspected Release: Hypothesize based on professional judgment guided by the Air Pathway Criteria List (page 21). If you suspect a release to air, use only Column A for this pathway and do not evaluate factor 2.

2. No Suspected Release: If you do not suspect a release, enter 500 and use only Column B for this pathway.

Targets (T)

3. Primary Target Population: Evaluate populations subject to exposure from release of a hazardous substance from the site. If you suspect a release, the resident, student, and worker populations on and within ¼ mile the site are considered primary target population. If only the number of residences is known, use the average county residents per household (rounded up to the next integer) to determine the population. In the space provided, enter this population. Multiply the population by 10 to determine the Primary Target Population score. Note that if you do not suspect a release, there can be no primary target population.

4. Secondary Target Population: Evaluate populations in distance categories not suspected to be subject to exposure from release, of a hazardous substance from the site. If you suspect a release, residents, students, and workers in the ¼ - to 4-mile distance categories are secondary target population. If you do not suspect a release, all residents, students, and workers onsite and within 4 miles are considered secondary target population.

Use PA Table 8 (page 23). Enter the population in each secondary target population distance category, circle the assigned value, and record it on the far-right side of the table. Sum the far-right column and enter the total as the Secondary Target Population factor score.

5. Nearest Individual represents the threat posed to the person most likely to be exposed to a hazardous substance release from the site. If you have identified a primary target population, enter 50. Otherwise, assign the score from PA Table 8 (page 23) for the closest distance category in which you have identified a secondary target population.

6. Primary Sensitive Environments: If a release is suspected, all sensitive environments on or within ¼ mile of the site are considered primary targets. List them and assign values for sensitive environment type (from PA Table 5, page 16) and/or wetland acreage (from PA Table 9, page 23). Sum the values and enter the total as the factor score.

7. Secondary Sensitive Environments: If a release is suspected, sensitive environments in the ¼ - to ½ - mile distance category are secondary targets; greater distances need not be evaluated because distance weighting greatly diminishes the impact on site score. If you do not suspect arelease, all sensitive environments on and within ½ mile of the site are considered secondary targets. List each secondary sensitive environment on PA Table 10 (page 23) and assign a value to each using PA Tables 6 and 9. Multiply each value by the indicated distance weight and record the product in the far right column. Sum the products and enter the total as the factor score.

8. Resources: A score of 5 can generally be assigned as a default measure. Assign zero only if there is no land resource use within ½ mile.

Sum the target scores in Column A (Suspected Release) or Column B (No Suspected Release).

Waste Characteristics (WC)

9.Waste Characteristics: Score is assigned from page 4. However, if you have identified any primary target for the air pathway, assign either the score calculated on page 4 or a score of 32, whichever is greater.

Air Pathway Score: Multiply the scores for LR, T, and WC. Divide the product by 82,500. Round the result to the nearest integer. If the result is greater than 100, assign 100.

PA TABLE 8: VALUES FOR SECONDARY AIR TARGET POPULATIONS

Distance from Site	Population	Nearest Individual (choose highest)	Population Within Distance Category											Population Value
			1 to 10	11 to 30	31 to 100	101 to 300	301 to 1,000	1,001 to 3,000	3,001 to 10,000	10,001 to 30,000	30,001 to 100,000	100,001 to 300,000	300,001 to 1,000,000	Greater than 1,000,000	
Onsite		20	1	2	5	16	52	163	521	1,633	5,214	16,325	52,136	163,246	
>0 to ¼ mile		20	1	1	1	4	13	41	130	408	1,303	4,081	13,034	40,811	
>¼ to ½ mile		2	0	0	1	1	3	9	28	88	282	882	2,815	8,815	
>½ to 1 mile		1	0	0	0	1	1	3	8	26	83	261	834	2,612	
>1 to 2 miles		0	0	0	0	0	1	1	3	8	27	83	266	833	
>2 to 3 miles		0	0	0	0	0	1	1	1	4	12	38	120	376	
>3 to 4 miles		0	0	0	0	0	0	1	1	2	7	23	73	229	
Nearest Individual =													Score =		

PA TABLE 8: AIR PATHWAY VALUES FOR WETLAND AREA

Wetland Area	Assigned Value
Less than 1 acre	0
1 to 50 acres	25
Greater than 50 to 100 acres	75
Greater than 100 to 150	125
Greater than 150 to 200 acres	175
Greater than 200 to 300 acres	250
Greater than 300 to 400 acres	350
Greater than 400 to 500 acres	450
Greater than 500 acres	500

PA TABLE 10: DISTANCE WEIGHTS AND CALCULATIONS FOR AIR PATHWAY SECONDARY SENSITIVE ENVIRONMENTS

Distance	Distance Weight	Sensitive Environment Type and Value (from PA Table 5 or 9)	Product
Onsite	0.10	x	
		x	
0-1/4 mi	0.025	x	
		x	
		x	
1/4-1/2 mi	0.0054	x	
		x	
		x	
		x	
		Total Environments Score =	

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AIR PATHWAY SCORESHEET

Pathway Characteristics

Do you suspect a release (see Air Pathway Criteria List, page 211)? Yes ___ No ___

Distance to the nearest individual: ___ ft

LIKELIHOOD OF RELEASE

	A Suspected Release	B No Suspected Release	Reference
1. SUSPECTED RELEASE: If you suspect a release to air (see page 211), assign a score of 550. Use only column A for this pathway.			
2. NO SUSPECTED RELEASE: If you do not suspect a release to air, assign a score of 500. Use only column B for this pathway.			
LR =			

TARGETS

3. PRIMARY TARGET POPULATION: Determine the number of people subject to exposure from a suspected release of hazardous substances to the air. ___ people x 10 =

4. SECONDARY TARGET POPULATION: Determine the number of people not suspected to be exposed to a release to air, and assign the total population score using PA Table 8.

5. NEAREST INDIVIDUAL: If you have identified any Primary Target Population for the air pathway, assign a score of 80; otherwise, assign the Nearest Individual score from PA Table 8.

6. PRIMARY SENSITIVE ENVIRONMENTS: Sum the sensitive environment values (PA Table 8) and wetland acreage values (PA Table 9) for environments subject to exposure from a suspected release to the air.

Sensitive Environment Type	Value
	Sum =

7. SECONDARY SENSITIVE ENVIRONMENTS: Use PA Table 10 to determine the score for secondary sensitive environments.

8. RESOURCES

T =

WASTE CHARACTERISTICS

8. A. If you have identified any Primary Target for the air pathway, assign the waste characteristics score calculated on page 4, or a score of 32, whichever is GREATER; do not evaluate part B of this factor.

B. If you have NOT identified any Primary Target for the air pathway, assign the waste characteristics score calculated on page 4.

WC =

AIR PATHWAY SCORE:

LR x T x WC / 82,500 =

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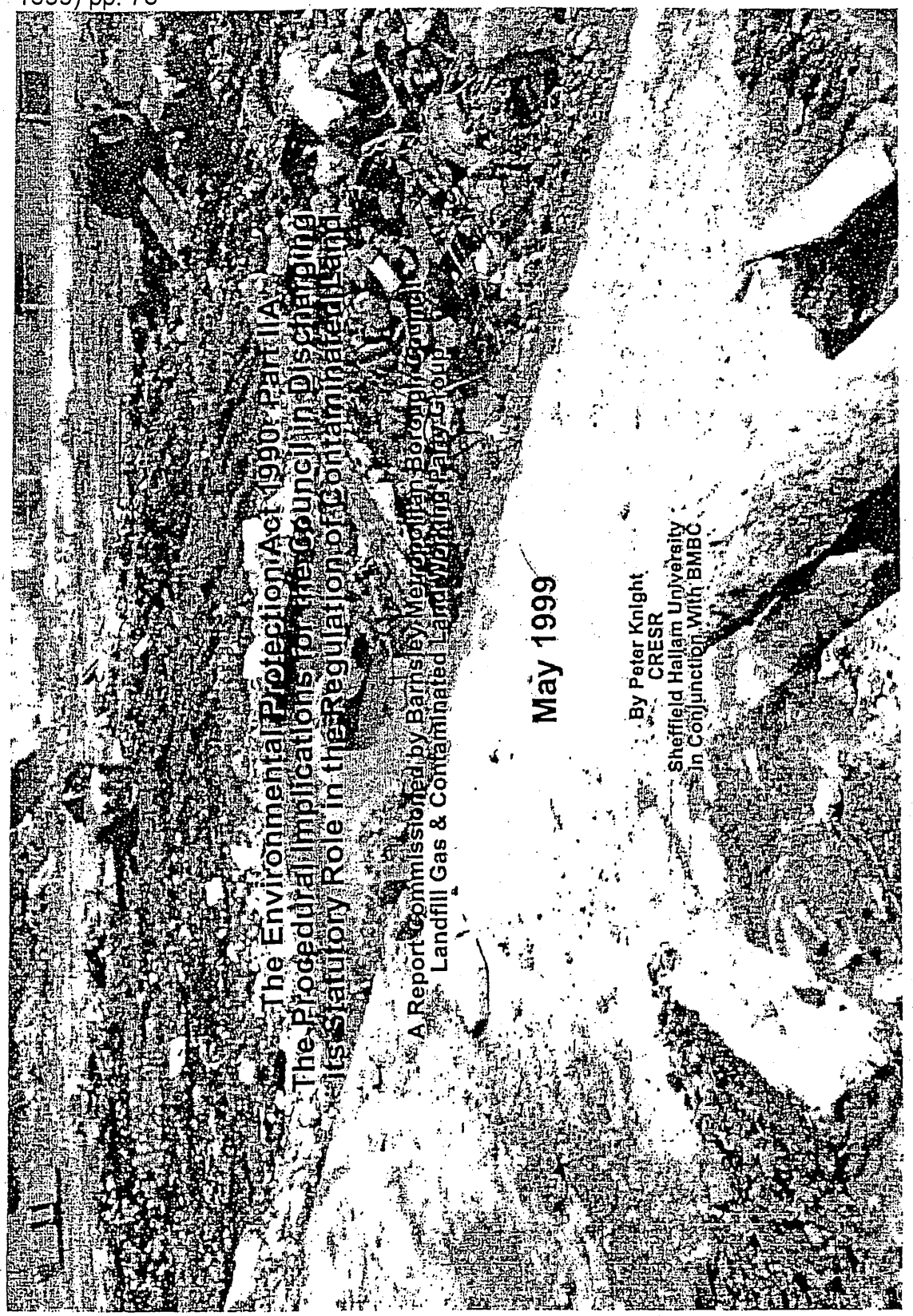
Appendix Eleven

Copy Relevant Research Experience

Report undertaken on behalf of Barnsley Metropolitan Borough Council the findings of which are presented in Chapter 6. Published by Barnsley MBC (May 1999) pp. 78



1.0. Introduction

There are many sites throughout the United Kingdom, which have been contaminated by past industrial processes. A number of these sites, left as they are, may pose a risk to humans and the wider environment. There is also the possibility that many of these sites may be reclaimed for new uses, including housing. Indeed demand for such sites is likely to increase in order to meet the Government's aspirational target of 60% of new homes on brownfield sites.

The Environment Act 1995 introduced a new framework for the identification and remediation of contaminated land[1]. Part IIA requires local authorities to inspect their areas for the purpose of identifying land which is contaminated. Part IIA also provides the first legal definition of contaminated land. This is 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"

The insertion of the word significant is important as it reduces the amount of land capable of being identified as contaminated. It has been estimated by Syms, (1997:289) that there may only be 2800 hectares of land capable of being classified as contaminated. Despite this, local authorities will still be required to undertake their statutory obligations. This will include preparing and implementing a strategy detailing how the authority intends to identify contaminated sites in its area within 15 months of the legislation coming into force. The implementation of the legislation has been delayed following a long period of consultation and it is now expected to come into force in July 1999 (DETR, 1998).

The purpose of this report has been to identify potential strategies and cost implications for Barnsley MBC in undertaking its statutory role in implementing contaminated land legislation.

Peter Knight is a PhD student at Sheffield Hallam University who is undertaking research monitoring the implementation of contaminated land legislation by local authorities. Peter Knight has worked as a Research Assistant on a Joseph Rowntree Foundation Report entitled "Contaminated Land for Housing". He will shortly be working on a follow up research project for the Joseph Rowntree Foundation identifying housing redevelopment case studies on brownfield sites. In addition he has had three months practical experience as a resident surveyor on a former paints factory which was redeveloped for housing.

[1] S.57 of The Environment Act inserts Part IIA in to the Environmental Protection Act 1990 and deals specifically with contaminated land.

3.0. The Pilot Study

3.1. Introduction

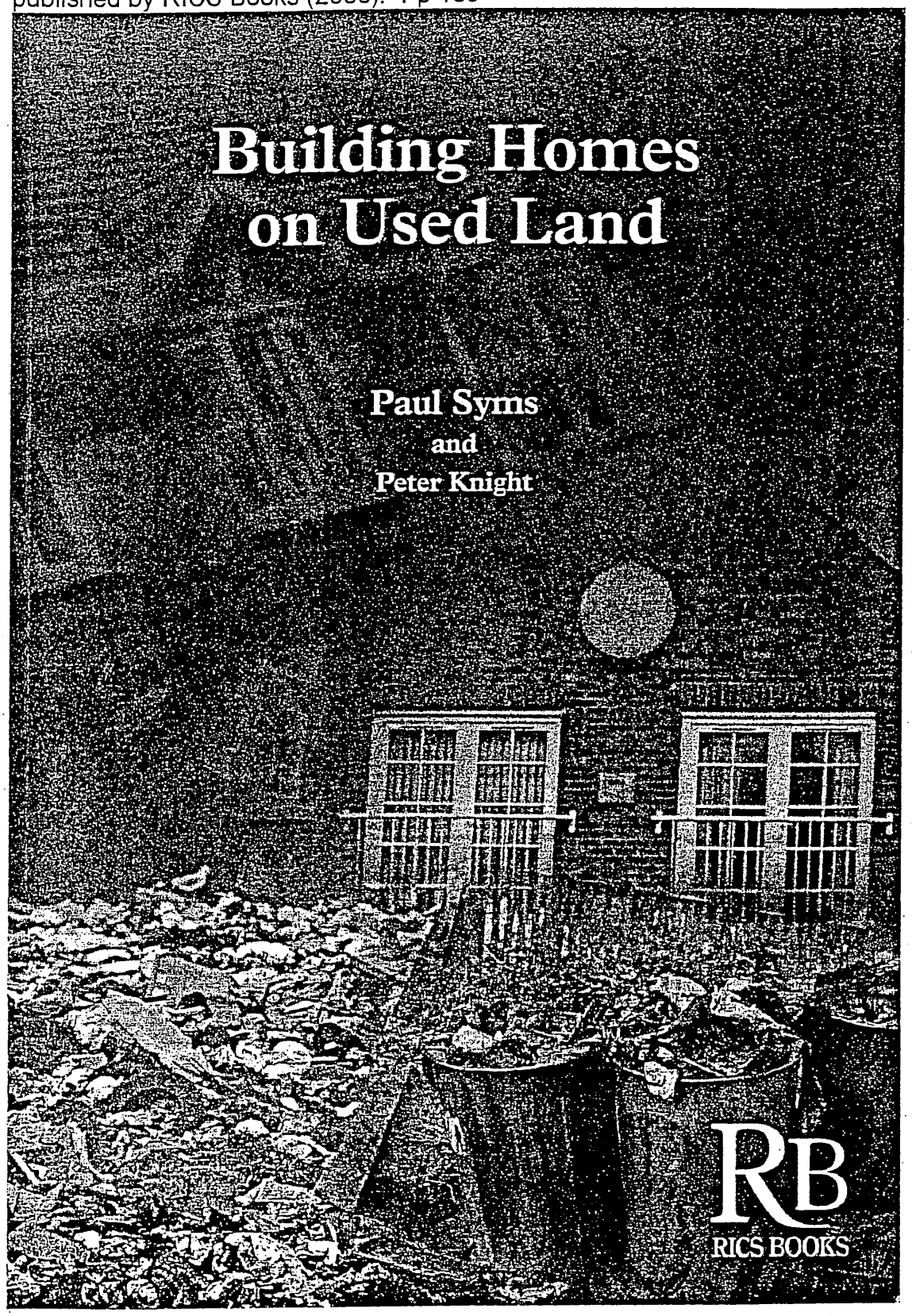
The purpose of the pilot study is to identify how Barnsley MBC will identify contaminated land in its area. A number of research questions were generated which are examined throughout the report. Section 4.0 to 9.0 describes the legal requirements of a strategy document and presents a strategy that will assist in the identification of contaminated land within the Barnsley borough. Section 10.0 provides details relating to the requirement of a public register of contaminated land. Sections 11.0 and 12.0 summarises the Council's roles and liabilities in relation to contaminated land. Sections 13.0 and 14.0 examines IT, training and staffing requirements. Potential sources of funding and benchmarking are discussed in Sections 15.0. and 16.0. Finally, the cost of implementing the legislation and recommendations are presented in Sections 17.0. and 18.0.

3.2. The Pilot Study Research Questions

The contaminated land pilot study had a number of primary research questions. These can be summarised as:

- What information exists relating to contaminated land in Barnsley MBC and where is it stored?
- How should this information be collated and stored?
- How should the information be interpreted?
- What strategy should Barnsley MBC adopt in order to deal with potential risks from contaminated land in order to fulfil its statutory obligation?
- Who should be responsible for collating and interpreting the information?
- Are any additional resources required and if so at what cost?
- What is the likely cost to Barnsley MBC to undertake its statutory obligation effectively?
- What funding is available to local authorities to implement the legislation?
- How should Barnsley MBC deal with any contaminated land in its ownership?
- How will the legislative regime interact with the planning system?
- How are other local authorities intending to implement the legislation?

Research undertaken on behalf of the Joseph rowntree Foundation and published by RICS Books (2000). Pp 109



Executive Summary

This research forms part of the Joseph Rowntree Foundation's 'policies into practice' programme and examines problems associated with developing previously used land. The study relates to two Government policies, the remediation of land affected by contamination and the reuse of previously-developed land for housing purposes.

The experiences of housing developers are used to illustrate the redevelopment process and highlight some of the problems faced by developers when tackling 'previously-developed' land. The research examined ten case studies of sites previously used for differing purposes and where various methods were employed for site remediation. The developments include social housing, shared ownership tenure, apartments and executive homes.

The study takes a constructive approach to the redevelopment process and does not seek to single out examples of 'bad practice' or avoidable mistakes. The case studies provide a number of useful lessons for housing developers and their advisors but there are four over-arching lessons applicable to all redevelopment situations:

- the need for a comprehensive site investigation, of which the historic study of land use forms an essential part;
- the need for a comprehensive written and photographic record, including waste handling notes, of all remediation works;
- the need for validation to demonstrate compliance with the remediation strategy and achievement of its goals;
- the need for factually correct and readily assimilated information on past uses, site investigations and remediation works to be made available to purchasers and tenants.

Assessing and treating development land

Before purchasing a site developers should employ a suitably qualified consultant to undertake a preliminary assessment to identify any possible hazards that may affect development. A desk study involves collection and analysis of available data and a walkover survey is an inspection of the site and surrounding area using information from

Executive Summary

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- the need for validation to demonstrate compliance with the remediation strategy and achievement of its goals;
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Assessing and treating development land

Before purchasing a site developers should employ a suitably qualified consultant to undertake a preliminary assessment to identify any possible hazards that may affect development. A desk study involves collection and analysis of available data and a walkover survey is an inspection of the site and surrounding area using information from

- Petrol filling station and motor vehicle workshops:
- Rail yard forming part of a town gas works:
- Road haulage:
- Shipbuilding works:
- Timber mill:

Conclusions and recommendations

Eleven distinct phases of development were identified and the main conclusions and recommendations for each were:

Project inception - developers and regulators must be prepared to act in a flexible manner to achieve the redevelopment of 'previously used' or 'brownfield' land and buildings.

Site acquisition and site assembly - landowners may have completely unrealistic ideas about the value of their land but, equally, they may be trapped by historic valuations and the fact that the land is used as collateral against bank borrowings or other loans.

Site assessment - it is important to identify any access or site constraints, including the adequacy of infrastructure, which may affect the development. All site assessments must initially comprise of an historical study followed by a 'walkover' survey.

Contaminant (Source) -pathway-receptor - all possible linkages should be considered. Remember that it may not be necessary to remove all contamination from the site, it may be feasible to break or remove the pathway instead.

Detailed design - examine the layout of the site and be prepared to consider alternative remediation strategies given different layouts.

Feasibility study - having completed the site assessment and having identified all potential pollutant linkages, the revised design should be the subject of a comprehensive review.

Planning and regulatory approvals - close liaison with the regulators during the earlier phases should ensure that the necessary information has been collected and can be presented in support of the applications. The need, or otherwise, for Waste Management or Mobile Plant licences should be identified as early as possible.

Development finance - banks and other financial institutions are probably more prepared to provide development finance for 'previously used' sites than they were a few

years ago, but there are still a few exceptions. Possible sources of grant aid should be identified and negotiations commenced as soon as possible after project inception.

Tendering - the appointment of contractors with experience of site remediation can be beneficial, as they may be able to suggest ways of undertaking the work. The scope of the work should be adequately described.

Construction - the site remediation/preparation works must be properly supervised and, most importantly, must be fully recorded - ideally this will involve maintaining photographic and written records, including sketches of where contaminants, or other site constraints such as old services, were located.

Sales and marketing - this includes the communication of information, to prospective purchasers and tenants, as to the previous use of the site, the contaminants found and the methods employed to prepare the site for redevelopment. It is important to be open with information relating to the site and its development, as any attempt at concealment is likely to have an adverse effect once it is discovered.

Joint article Published in Green Government September 2002 with Jason Clay URS Dames and Moore.

Using supplementary credit approval to solve contaminated land problems in Sheffield

Over the past few years, Sheffield City Council has undertaken a series of investigations in and around the Manor Park housing estate. These identified the presence of soil contamination arising from made ground remnant from historical landfilling of the area. Jason Clay of URS and Peter Knight of Sheffield City Council detail the process

Sheffield used Supplementary Credit Approval to undertake an in depth study that would state categorically whether the contamination constituted a significant health risk to the people of the estate. URS was commissioned to undertake the study, which was designed using a risk-based approach. The objectives were to understand the history of the area, develop a sampling strategy to investigate and assess the distribution of contamination and to interpret the results using geo-statistics and probabilistic risk assessment. The primary purpose of the assessment was to determine whether the observed concentrations of soil contaminants posed a potentially significant risk to the health of those living on the estate.

a scoping exercise allowed the focus to be directed towards a smaller number of 'priority' contaminants

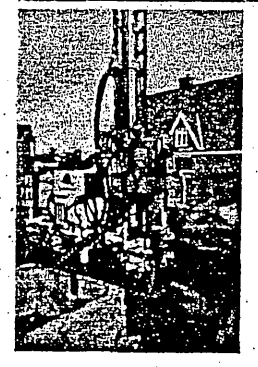
Initially, URS undertook a desk study review to ascertain the quantity and quality of available site data. This review utilised documents prepared by or on behalf of Sheffield City Council and other relevant sources of information, such as geological, hydrogeological and historical maps. This work confirmed that historically the topography of the site had included two separate river valleys. The area had been in use since at least 1856 for coal mining, with associated coke ovens and quarries developing over time. Construction of the housing estate began in 1938. Throughout this time the river valleys were filled with mining waste materials and latterly domestic refuse. A 3-D representation was prepared of the changing topography of the site over a period of 150 years.

Due to the highly variable composition of fill materials, it was considered potentially possible that a large range of contaminants may be present at the site. A preliminary human health risk assessment was conducted in order to determine those chemicals that were likely to present a potential health risk if present, and those that weren't and could therefore be removed from further assessment. This scoping exercise allowed the focus to be directed towards a smaller number of 'priority' contaminants.

A sampling strategy was designed to collect near surface samples from almost all the houses on the estate (over 1,000) and to investigate the depth and extent of fill material, groundwater quality and the potential for landfill gas generation.

The geology of the area was found to comprise varying depths of made ground (at depths up to and exceeding 10m) consisting predominantly of ashy wastes, overlying weathered Lower Coal Measures.

The concentrations of lead and the polycyclic aromatic hydrocarbons (PAH) were found to vary greatly across the site, and were observed at a small number of locations at concentrations high enough to warrant further consideration. The distribution of the results was investigated using the complex statistical technique of geostatistics. This allowed URS to determine whether contamination was entirely randomly distributed or whether there were any localised areas of higher concentrations. The results did not show a significant tendency to be grouped together and therefore it was possible to say that no part of the estate was any better or worse than any other.



A much more detailed human health risk assessment was then undertaken to derive probabilistic risk based screening levels. Where statistically outlying, higher, results were found, additional sampling was undertaken to obtain an estimate of average soil concentrations in that area. At all of these locations, the average contaminant concentration was found to be below the screening level, indicating that the potential health risk to residents at those locations was insignificant.

It was therefore concluded that although the Manor Park estate was underlain by waste and fill materials contaminated with PAHs and heavy metals, the concentrations of these chemicals at the ground surface was insignificant in health terms at all sampled properties. On this basis, it was considered that there were no immediate health risks at the Estate from land contamination, and that residents of the estate should continue to use their homes and gardens as normal including for growing vegetables. gg

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