

THE IMPLICATIONS TO INDUSTRIAL SITES OF RISK AND HAZARD-BASED APPROACHES TO MANAGING LAND CONTAMINATION

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Political and legislative mechanisms for the management of land contamination consist of risk-based and hazard-based approaches. These impact on businesses in different ways and may be financially onerous. A corporate management strategy for addressing land contamination issues, both real and perceived, will enable companies to meet their legal obligations, minimise financial impacts and develop cost-effective strategies for the resolution of genuine contamination problems.

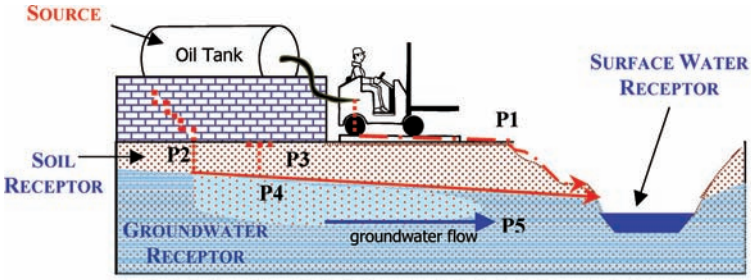
INTRODUCTION

Land contamination at industrial sites is a significant issue that warrants a corporate management strategy. This is true even at modern, well-run installations due to the widely held belief that industry pollutes. The perception of risks arising from land contamination can cause substantial difficulties if the company or property is put up for sale, or can be a source of concern to members of the public, especially where pollution impacts to local communities have occurred. At mature sites with a history of industrial activities, in some cases extending over a hundred years or more, genuine contamination problems may exist. These may attract regulatory attention or result in significant delays when development projects are planned.

Prevailing political and legislative mechanisms for the management of land contamination consist of risk-based and hazard-based approaches. These impact on businesses in different ways and may be financially onerous. A corporate management strategy for addressing land contamination issues, both real and perceived, will enable companies to meet their legal obligations, minimise financial impacts and develop cost-effective strategies for the resolution of genuine contamination problems.

WHAT IS LAND CONTAMINATION?

The term “land contamination” is broad and the exact meaning varies according to the context in which it is used. Essentially however, it can be considered as encompassing the presence of harmful solids, dissolved substances, liquids and gases (the contamination *sources*) that are or may be present in soil, sub-soil, underlying strata, groundwater or surface waters at a site. On sites where contaminative activities have been undertaken over a period of time, it is likely that buildings, building materials and service routes



Pathways:

P1: Spillage to ground and surface run-off into river.

P2: Leakage through damaged bund and migration through permeable ground to groundwater.

P3: Migration along top of water table and emergence at spring line.

P4: Dissolution in groundwater.

P5: Potential recharge of river by contaminated groundwater.

Figure 1. Source – pathway – receptor model *(Adapted from McBarron, 2004)*

will be contaminated. Raw materials and wastes present at a site may also contain harmful substances.

In assessing actual or potential harm from land contamination, it is also necessary to identify the *receptors* that may be affected (e.g., people, water, ecosystems, property) and the *pathways* by which the contamination will reach the receptors. The *source-pathway-receptor* model [Figure 1] is used for the assessment and management of land contamination risks.

THE CURRENT POLITICAL AND THE LEGISLATIVE CONTEXT

At present, two main approaches are found in UK policy and legislation related to managing land contamination: control of hazards and action based on the assessment of risk. These quite different approaches can be found working together within specific regulations, or working separately to achieve specific objectives that are best approached by one of the means or the other. Risk-based approaches are now widely accepted by policy makers as a pragmatic means of dealing with the contamination legacy, while both risk and hazard-based approaches are being implemented for the prevention of future contamination.

Examples of key risk and hazard-based legislation and guidance are listed in Table 1. Both approaches have implications for businesses, as well as advantages and disadvantages to society as a whole.

Table 1. Summary of key uk legislation and guidance with implications for management of contaminated land

Mechanism	Objective	Hazard-based aspects	Risk-based aspects	Application
Town and Country Planning Act, subsequent regulations & guidance, particularly PPS 23 (ODPM, 2004).	To control development and allocate land use. On land affected by contamination, the principle objective is to ensure that any unacceptable risks are addressed.	In some cases public perceptions of the risks could drive site-remediation to become hazard based.	Contamination risks must be assessed and remediation planned to ensure the site is suitable for its intended use. Considers a wider definition of contamination than the Part IIA regime.	Legacy Removal & Prevention
The Contaminated Land Regime: consisting of Part IIA of the Environmental Protection Act 1990, Contaminated Land Regulations 2000, statutory guidance (DETR 2000) & amendment by Water Act 2003.	To provide a system for the identification and remediation of contaminated land, where the contamination is causing unacceptable risk to human health, controlled waters, ecosystems or property.		It focuses on the risks from significant pollutant linkages arising in the context of the current use and circumstances of land. Where the statutory definition of contaminated land is met, local authorities are responsible for ensuring that the land is remediated in line with the "suitable for use" approach.	Legacy Removal
Water Resources Act 1991, Sections 161 and 161A	To prevent or remove pollution to controlled waters with cost recovery from the responsible parties.		Is used as an enforce-ment tool based on an assessment of risks. Overlaps with Part IIA.	Legacy Removal & Prevention

(*Continued*)

Table 1. *Continued*

Mechanism	Objective	Hazard-based aspects	Risk-based aspects	Application
Wildlife and Countryside Act 1981 & subsequent amending Acts	To protect wildlife in Britain by prohibiting: • the intentional killing, injuring or taking of wild animals and plants, • intentionally damaging or destroying a place or structure used for shelter or protection.		Used to prosecute those responsible for causing an unacceptable risk or actual harm to protected wildlife or habitats.	Legacy Removal
Pollution Prevention & Control, consisting of primary legislation, secondary regulations & guidance	Establishes a holistic approach to environmental protection based on "Best Available Techniques" (BAT) for the prevention of "significant" pollution during operation of the installation. Introduces closure requirements relating to land condition.	Requires adoption of indicative BAT standards, including measures to prevent accidents & limit their environmental consequences, regardless of the sensitivity of the location. At closure, operators are required to remove any releases to land, regardless of the risk or intended future use.	Only applies to larger "polluting" installations using plant exceeding specified capacities or producing product over a specified production rate. Site specific risk assessment can be used to justify failure to meet BAT, however, may only result in a delay in implementation. At closure the site must be returned to a "satisfactory" state, with no pollution risk.	Prevention

Groundwater Regulations & guidance (including Defra 2002 and 2004)	To prevent discharges of the most hazardous List I substances and prevent pollution of groundwater by List II substances.	Substances considered are on basis of inherent hazards.	Permitted discharges to be based on environmental sensitivity of location & potential for hazardous substances to enter groundwater. Guidance based on risk management principles.	Prevention
Waste Management Licensing Regulations	Establishes a comprehensive system of licensing extending to the storage, treatment and disposal of waste.	Prescriptive requirements for technical competence.	Requires a hydrogeological risk assessment for sites managing List I or List II wastes. Many activities are exempted from licensing. Licence surrender requires assessment of whether final condition of the land may cause pollution.	Prevention
Control of Pollution (Oil Storage) (England) Regulations	To prevent pollution arising from the storage and use of oil in above ground facilities.	Petroleum hydrocarbons are List I substances under EC directives, i.e., in the category of highest hazard. Prescriptive rules for storage (i.e., source containment) apply regardless of the environmental risk.	Only applies to commercial, industrial, institutional premises where >200 litres are stored or domestic premises where >3500 litres are stored. A phased implementation timetable was based on a source-pathway-receptor risk assessment.	Prevention

(*Continued*)

Table 1. *Continued*

Mechanism	Objective	Hazard-based aspects	Risk-based aspects	Application
Control of Major Accident Hazard Regulations (COMAH)	To prevent major accidents involving dangerous substances & limit the consequence to people & the environment of any which do occur. Aims achieved by source containment/control & pathway assessment.	Applies to companies that manufacture, use or store specified dangerous substances (including dangerous for the environment) above threshold quantities, regardless of existing controls or other permit requirements.	Only applicable to companies storing large quantities of dangerous substances, e.g., oil, natural gas, chemicals or explosives. Two thresholds for controls are based on quantities stored.	Prevention
EEC Regulation of Existing Chemicals	To evaluate and control the risks of existing substances.	Aims to either ban or restrict the use of hazardous substances.	Assessment is risk-based.	Prevention
Landfill (England & Wales) Regulations	To prevent pollution from the disposal of waste in landfill.	Prescriptive requirements on the construction and operation of landfills, including the banning of liquids, infectious wastes, tyres and any other wastes that may be corrosive, oxidising, flammable or explosive within landfills.	Phased implementation timetable is based on a risk assessment. Management requirements relate to mainly to the risk of gas and leachate generation.	Prevention

Packaging (Essential Requirements) Regulations	To reduce pollution arising from the use and disposal of packaging.	Restricts concentrations of Cd, Cr VI, Pb, and Hg in packaging materials to <100 ppm from June 2001. The regulations also require that noxious or hazardous substances in packaging must be minimised in emissions, ash or leachate from incineration or landfill.	Prevention

Notes: 1) Much of the UK legislation listed below transposes European Directives.
2) This is not intended to be a comprehensive list.

RISK-BASED APPROACHES

Management of the contamination legacy is mainly being achieved via the planning system when development work is undertaken. New government guidance to planning officers (Office of the Deputy Prime Minister, 2004) has increased the stringency of controls that must be applied before planning applications are approved. The presumption in the case of sites with past industrial use is that land contamination is likely. The developer is responsible for undertaking an adequate investigation of the risks and proposing an appropriate development strategy for ensuring that the site will be "suitable for the intended use". Where remediation is required to address contamination risks, the government recommends that officers require a validation report demonstrating the effectiveness of the work to be submitted and approved, preferably before the start of building.

Developments that involve piled foundations are considered to pose particular risks on contaminated sites. The Environment Agency (EA) has therefore published specific guidance that sets out the method by which a "Foundation Works Risk Assessment Report" should be produced (EA, 2001). This report would accompany the planning application and be subject to review by the EA, who is a statutory consultee in planning applications involving contaminated land.

Other legislation is in place to deal with historic contamination that poses unacceptable risks. This includes the relatively new Part IIA Contaminated Land Regime, which for the first time, provides an explicit statutory definition of contaminated land based on the risks arising in the context of the current land use and site circumstances (DETR, 2000). The regime requires local authorities to inspect land within their district to identify contaminated sites and arrange for clean up where necessary, with cost recovery from the responsible parties. Sites designated as "Special Sites" (including those permitted under other legislation) are transferred to the EA or the Scottish Environment Protection Agency (SEPA) who take on the role of lead regulator following designation. The EA and SEPA are also responsible for advising on matters relating to pollution of controlled waters.

The powers under Part IIA are to be used where historic contamination:

- is causing, *or has the potential to cause*, significant harm to humans, protected habitats or property,

OR

- is causing pollution of controlled waters, *or there is a possibility of such pollution being caused.* (Note: amendments to the primary legislation will add a significance test for assessment of controlled waters).

Risk-based legislation also remains in force for the surrender of waste management licences which fall outside of the scope of the Pollution Prevention and Control Regulations (PPC). Under the Waste Management Licensing Regulations, the EA will only accept a licence surrender if it is satisfied that the final condition of the land, as affected by the waste activities undertaken, is unlikely to cause pollution or harm.

Risk-based approaches offer a number of benefits with regard to sustainability. These include:

- Undertaking remediation only where an unacceptable risk warrants action.
- Limiting expenditure to actions where a cost-benefit can be demonstrated.
- Restricting the financial drain on companies, as well as to society as a whole.

It is prudent to limit intervention as remediation carries overheads which may outweigh the benefits associated with taking action. For example, metals cannot be destroyed but are often immobile. If a site is being redeveloped for a commercial use where the land will be covered with hard surfacing, the metals may pose little risk to humans or the environment as they will not be exposed and can therefore be left in the ground. To remove the metals, in contrast, could result in a number of impacts: dust/noise from extraction, run off of contaminated sediments into surface waters, air pollution/noise from vehicles, disposal to landfill using up limited void space capacity, etc. It would also be a much more expensive management approach.

In the future, better techniques for remediation may be available which have lower environmental impact and are more cost-effective. At the present time, remediation is often an expensive business and a greater environmental benefit could be gained by spending the money elsewhere, e.g., funding of local biodiversity improvement schemes. In many cases, the companies responsible for historic contamination are no longer trading and the cost of clean up would fall to society as a whole, where again limited financial resources may be better spent on other priorities such as health services or schools. It is also the case that a certain amount of land is required for low-risk uses, such as for commercial and retail development, and therefore society can accept the contamination legacy at such sites where the risks can be more easily controlled.

There are some disadvantages of using a risk-based approach for management of land contamination:

- It assumes that we know what we're doing, yet the assessment of both hazards and risks are continually developing sciences.
- It can leave a legacy of contamination that could blight future development and beneficial uses.
- Effective communication of risks and risk-based decisions to the public is difficult.
- The risk-based approach is less acceptable to the public and non-governmental organisations (NGOs), who play an increasing role in contaminated land management decisions.

HAZARD-BASED APPROACHES

Hazard-based approaches to contamination prevention are favoured by politicians, the public and NGOs. The application of this approach in EU law is typified by the principle in the Integrated Pollution Prevention and Control Directive that permitted installations

must not cause any "significant" pollution. This results in an absolute liability for clean up of land contamination caused under the permit, regardless of the risk posed or the intended use of the site following closure.

The advantages of hazard-based approaches are as follows:

- It is generally more cost-effective to prevent contamination from occurring than to pay for its clean up.
- Hazard elimination and substitution are methods at the top of the risk management hierarchy and are therefore preferred approaches, particularly where safer alternatives can be found.
- It fulfils one of the core EU principles of environmental protection: "the precautionary principle".
- It may be simpler to understand and implement.
- The approach is more acceptable to the public and NGOs.

However, hazard-based approaches also carry significant financial and global disadvantages, which include:

- The cost of prevention may be excessive relative to the potential "harm".
- The "polluter pays" principle is in reality the "producer pays". If consumers are not prepared to pay extra for products manufactured in an environmentally responsible way, the problem of land contamination is merely shifted elsewhere (i.e., to the developing world) and the overall environmental impact is increased as a result of global transportation of goods.
- The elimination of hazards, which is the aim of some EU legislation, may not always be practical. Moreover, banning of known hazardous substances could lead to the use of alternative substances which have worse, but as yet unknown, harmful effects.

FUTURE DEVELOPMENTS

The current combination of risk-based and hazard-based approaches to the management of land contamination represent a pragmatic balance that acknowledges the impracticality of redressing the entire contamination legacy, but seeks to prevent future problems. However, the balance is tipping towards prescriptive hazard-based controls with more rigorous enforcement.

This is partly driven by our increasingly risk averse society, where public trust in government, as well as business, has been eroded as a result of poor practices and lack of corporate responsibility in the past. A 2004 European survey found that only 2% of people trusted companies on environmental issues, with over half favouring stricter regulation coupled with heavy fines as the only effective means of solving environmental problems (ENDS, 2005).

Evidence of this can be seen in the current European Commission (EC) consultation on its Thematic Strategy for Soil Protection, which considers a number of impacts including land contamination (EC, 2005). The Task Group considering Contamination and Land

Management made a number of recommendations that could impose further burdens on industry if adopted (EC, 2004). These include:

- Member States should develop inventories of potentially contaminated sites.
- Environmental liability should be strengthened by a regime of obligatory financial security or insurances depending on the size and type of activities and the efficiency of implemented preventative measures.
- Soil assessment should be made obligatory at the start and closure of potentially soil polluting activities.
- Information on soil contamination owned by private parties, such as the land owner or operator, should be made publicly available.
- The rights of an owner can interfere with "public interest", and therefore should be given lesser status.

The Strategy is due to be adopted in November 2005 following an open consultation with citizens, organisations and experts. This will result in a Communication laying down the principles of a Community Soil Protection Policy and a proposal for a Soil Framework Directive.

POTENTIAL FINANCIAL IMPLICATIONS FOR BUSINESS

Land contamination issues can result in significant cost implications to businesses, some but not all of which derive from the legislative mechanisms discussed above. Some of the most common circumstances in which financial liability can arise are discussed below.

THE COMPANY CAUSED LAND CONTAMINATION DURING HISTORIC ACTIVITIES (REGARDLESS OF WHO NOW OWNS THE LAND).

- Companies can be held liable under Part IIA for remediation of contamination they caused in the past.
- Common law actions may be taken against the company by third parties in respect of damages caused by historic contamination.

THE COMPANY OWNS LAND THAT IS CONTAMINATED AS A RESULT OF HISTORIC ACTIVITIES (REGARDLESS OF WHO CAUSED THE CONTAMINATION).

- Land owners can be held liable under Part IIA if the party responsible cannot be found, is no longer in existence or is insolvent.
- As above, costs may arise from common law actions.
- If the company undertakes any development of the property that requires planning permission, the presence of contamination must be investigated and remediation may be required to ensure the site is "suitable for the intended use".

- If the company or land is sold, the actual or potential existence of land contamination could result in property blight, reduced sale value, or delays in completion of the transaction while risks and transfer of liability are evaluated.

THE COMPANY IS RESPONSIBLE FOR A POLLUTION INCIDENT OR IS ALLOWING ON-GOING LAND CONTAMINATION TO OCCUR.

- The company can face prosecution, fines and clean up costs for pollution incidents under various regulations such as the Water Resources Act or the Wildlife and Countryside Act.
- If the responsible activity is covered under a permit, the company can face enforcement action (including prohibition) for breach of the permit conditions and/or will be required to take action to prevent further contamination from occurring.
- As above, costs may arise from common law actions.
- From 2007 (following transposition of the Environmental Liability Directive into UK law), companies will be liable for environmental damage caused during the operation of specified permitted activities or involving the use or transport of dangerous substances or genetically modified organisms.

THE COMPANY UNDERTAKES ACTIVITIES THAT HAVE A POTENTIAL TO CAUSE LAND CONTAMINATION

- Companies regulated under Pollution Prevention and Control (PPC) will incur compliance costs arising from:
  - The need to investigate the contamination baseline of the site at application and permitting stage.
  - The implementation of pollution prevention measures, including infrastructure, maintenance, monitoring and management systems.
  - The remediation of any contamination that occurs during the permit life, regardless of its harmfulness, the environmental sensitivity or future uses of the site.
  - The need to demonstrate that the property has been returned to a "satisfactory" condition at closure, including additional site investigation work and submission of a site closure report.
- Companies regulated under the Control of Major Accident Hazards (COMAH) will incur compliance costs arising from:
  - The need to assess the potential for Major Accidents to the Environment (MATTE).
  - The implementation of pollution prevention measures, including infrastructure, maintenance, monitoring and management systems.
- Companies operating in England that store more than 200 litres of oil in above ground facilities were required to implement a series of prescriptive pollution prevention measures by September 2005. Failure to comply is a criminal offence that can result in prosecution or a fine, regardless of whether a pollution incident has occurred.

- Companies regulated under the Waste Management Licensing Regulations for non-PPC waste activities will incur compliance costs arising from:
  - The need to undertake a hydrogeological risk assessment where activities involve List I or List II substances.
  - The implementation of measures to prevent pollution of the environment.
  - The requirement to make financial provision to ensure that the obligations arising from the licence will be discharged, e.g., aftercare monitoring.
  - The need to demonstrate at licence surrender that the condition of the land, as affected by the regulated waste activities, is unlikely to cause pollution.

Additional impacts that may arise in conjunction with any of the above situations include:

- Requirements for legal advice or legal representation in court cases.
- Increased insurance premiums or inability to obtain insurance, particularly where control of risks is not considered satisfactory.
- Loss of share value, shareholder confidence or restrictions on access to capital loans.
- Adverse publicity.

DEVELOPING A CORPORATE MANAGEMENT STRATEGY

Faced with a range of legislative mechanisms and potential financial liabilities which are likely to become more onerous in the future, businesses would be wise to develop a corporate management strategy for land contamination issues at the earliest opportunity.

This should be structured along the lines of all good management approaches and include the following stages:

1. Assess the issues and potential impacts on the business.
2. Develop (or update) a management plan.
3. Implement the plan.
4. Review the effectiveness at regular intervals.
5. Repeat the cycle.

INITIAL ASSESSMENT

The initial assessment of the issues and potential impacts should be wide ranging and cover technical, financial and strategic matters.

A critical activity in the initial assessment will be the amalgamation of information relevant to an understanding of the land contamination issues that could impact on the business. Most companies hold information in various forms including foundation studies, due diligence reports, PPC site condition reports, etc. A systematic review of available information will enable the development of an informed view of the issues facing the business, identification of areas of uncertainty and prioritisation of management

actions. Such a review may be undertaken by qualified in-house staff if available, or by an independent consultant.

At this time it would also be beneficial to prepare a forward plan designed to complement overall business management plans and which indicates the timing of particular impacts and requirements. This should cover a 5 to 10 year period, with the specific actions arising from different drivers (which may be definite, probable or possible) mapped out over the projected implementation dates. This may be put together by an in-house team that includes environmental staff and senior management with accounting support. External consultants may be useful in providing additional input, facilitation or peer review services.

From the initial assessment, the company should be able to determine the likely significance of various issues and the appropriate amount of resource that should be allocated to work on their management.

DEVELOPING THE MANAGEMENT PLAN

In developing an integrated management plan for addressing land contamination issues, the following factors should be considered:

- Future business plans.
- Legislative compliance and avoidance of regulatory intervention.
- Minimisation of costs over short, medium and long-term timescales.
- Asset protection and enhancement, particularly with regard to improving the company's value in potential land or company sale transactions.
- Providing confidence to stakeholders that potential liabilities are being controlled.

Future business plans will inform the management strategy. Strategic company plans such as divestment or development projects are often more important than legislative drivers, and will influence the scope and prioritisation of actions within the management plan.

The piecemeal approach often taken to legislative compliance should be replaced by an integrated plan based on an understanding of current and impending requirements mapped over the planning timescale. This approach will enable economies to be gained in the use of in-house resource, the employment of sub-contractors and upgrading activities. Awareness of good practice guidance can also assist in ensuring that measures taken are justifiable and will be defensible over the depreciation period of any capital spend.

Issues that might attract regulatory attention should be anticipated and action taken to minimise the potential. In some cases, this may involve undertaking further investigation of land contamination as a defensive measure, for example to enable a response should the land be considered for potential designation under Part IIA or to demonstrate that impacts to off-site receptors are not significant.

Should unacceptable contamination risks be found, it is preferable to take ownership of the situation than be subject to regulatory enforcement action, where the actions, timescales and level of expenditure may be prescribed. The management of contaminated areas should be planned in accordance with the Environment Agency's Model Procedures

(EA, 2004), which provide a framework for risk assessment, options appraisal and the measures expected in the implementation of a remediation strategy, including validation and aftercare. The use of this "best practice" framework will provide the company with a documented record of the decision making process that will not only be acceptable to regulators, but should also provide confidence to other stakeholders and interested parties.

The costs associated with the investigation and management of land contamination can be significant. The management plan provides a mechanism for the company to ensure that expenditure is cost effective and will satisfy not only current, but also future business requirements. The plan should identify opportunities for rationalising programmes of work and obtaining best value for purchased services. Sufficient care should always be taken to ensure that investigations and management actions will meet the requirements of the relevant stakeholders, so that effort and expenditure is not wasted.

Measures to ensure that the company and property can be fairly valued should be included in the management strategy. Where there is uncertainty over the significance of land contamination issues, it will be appropriate to plan further investigation and risk assessment work, even when it is not a legislative requirement. This is work that may take some time to complete and should not become a last minute activity or left up to a prospective buyer. The benefit will be that companies can then make informed decisions as to whether the remediation of contaminated areas would have a cost-benefit in enhancing (or preserving) the asset value.

An advantage of undertaking remedial work as an operating company is the potential to employ remediation techniques that operate slowly, use less resources, have less environmental impact and cost less than conventional techniques (Bardos, 1996). Such techniques are under development throughout the world, due to the often unacceptable environmental and economic impacts associated with the traditional "dig and dump" or "pump and treat" approaches. There are about 30 generic remediation technologies and several hundred commercial variants, many of which are commercially available in the UK and should be considered (Nathanail, 2002). Following the options appraisal framework given in the Model Procedures (EA, 2004), a short list of feasible technologies should be identified that are likely to be able to achieve the core remediation objectives and are suitable for the site specific constraints (such as space, time available, depth to contamination). A detailed appraisal can then be undertaken to enable the most suitable technology to be selected.

Where residual risks arising from land contamination issues remain, it may be appropriate to manage these by using environmental insurance policies (Brierley, 2005). Policies are available for the following circumstances:

- On-going operational risks, e.g., for pollution incidents under PPC.
- Risk of deteriorating conditions.
- Clean-up cost cap: which protects against remediation cost overruns during development due to unforeseen contamination.
- Contractor's pollution liability: which will cover the costs of a pollution incident that occurs as a result of remediation or redevelopment, and which may not become apparent for some period of time.

- Environmental impairment liability: which covers liability for offsite pollution incidents that occur during the remediation and development phases, regulatory intervention, and third party claims resulting from residual problems not identified at the remediation stage, including those arising from changes in legislation.

PLAN IMPLEMENTATION AND ON-GOING ACTIONS

As with any management strategy, it will only be effective if properly implemented, monitoring and reviewed on a regular basis. As contamination issues at the site become better understood and controlled, the work required to maintain on-going management will reduce. An annual review to re-assess changes in business plans, legislation and the status of investigation and remediation programmes is recommended to ensure that the strategy remains both relevant and effective.

CONCLUSION

Land contamination can be a difficult issue to manage due to the public's perception of risk, the poor management of past problems by industry, media portrayal, and the hardships that have occurred in cases of significant contamination.

While the legacy of historic contamination is mainly being addressed via risk-based legislative approaches, more prescriptive hazard-based approaches are increasingly being employed to ensure the prevention of future contamination. Both approaches have potentially significant financial implications that businesses need to understand and manage.

The implementation of a corporate management strategy for management of land contamination issues will provide confidence to company stakeholders that a significant area of potential liability is under control, as well as satisfying the requirements of good corporate governance, and in some cases, increasing asset value. The use of a structured and documented management plan, with decision making undertaken in accordance with best practice frameworks such as the Model Procedures, provides the mechanism for reducing business risk in a cost-effective manner.

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