

Chapter 12

Contaminated land



Contaminated land

SUMMARY

Overview

In Canterbury, as in other regions of New Zealand, contamination of land has arisen through leaks, spills, inappropriate disposal and intentional application of hazardous substances to soil. The extent of the problem is difficult to determine: more than 3000 sites are currently registered on the Listed Land Use Register (LLUR), but this represents an incomplete picture. Ongoing efforts are focusing on identification of sites, management systems to make this information available and policy to promote appropriate management action at these sites.

Resources

Statutory requirements have historically mandated practices involving the application of hazardous substances, such as sheep dipping, spray regimes for horticulture, and the treatment of timber. Some of these requirements remain in place today.

Hazardous substances are also used in a wide range of industrial processes and applications across various industry sectors throughout New Zealand.

Another significant contributing factor in land contamination is the prevalence of disposal to landfill as the most common method of disposal of domestic refuse. Storage of petroleum products, for use in the running of motor vehicles and for heating, and industrial processes, also contributes to contamination risk.

Processes

Chemicals used for dipping, spraying and other treatment processes can be persistent in soils and have adverse health and environmental effects. Additionally, contaminants in soils can be mobilised to enter groundwater through natural processes such as rainfall. Groundwater contamination can also be caused by landfill leachate.

Petroleum products are typically stored in underground storage tanks, creating a risk if these containment systems fail. Contamination can occur through leaks and through spills during refilling or dispensing of these products.

Poor management and regulation of hazardous substance use, storage and disposal, leads to increased risk of release into the environment.

Outcomes

In Canterbury, there are currently more than 3000 sites on the Listed Land Use Register (LLUR). The LLUR is incomplete, however, and so is not reliable as an indicator of the total number of Hazardous Activities and Industries List (HAIL) sites in the region.

Areas of land, groundwater and sediment are contaminated at levels higher than background concentrations, but the extent and severity of contamination is unknown.

Responses

Environment Canterbury is addressing these issues by undertaking the following activities:

- The investigation of land for the purposes of identifying and monitoring contaminated land
- Development of the Contaminated Land Management Strategy, defining how Environment Canterbury will monitor and manage contaminated land
- The LLUR and the registration process, which ensure that information held is managed in a clear and consistent manner
- Development of a web-based search system allowing territorial authority staff to query the LLUR for information. This allows contaminated-site information to be made available to parties involved in decision-making and management of sites

- Involvement with national guideline development to ensure a nationally consistent approach to contaminated land management. This also ensures that the interests of Canterbury communities are represented at a national level through submissions on any proposed national contaminated land management guidelines
- Authorisation of discharges and hazardous substance storage, in order to mitigate the effects of these on the environment
- Rules in the Natural Resources Regional Plan (PNRRP), providing information and control of activities
- Provision of information to the public through responses to property enquiries, with information of an appropriate quality sufficient for their needs, while meeting statutory responsibilities under official information legislation
- Enforcement action, responding to incidents to minimise and remediate adverse effects
- Regional investigations into particular aspects of contamination, which can assist in the management of contaminated sites, for example, horticultural soils project, background concentrations of contaminants in soil
- Advocacy through information available on the Environment Canterbury website, development of fact sheets, meeting with contaminated land practitioners and stakeholders and other activities

Territorial Authorities also have a significant function in the management of contaminated land, in particular, in the prevention or mitigation of any adverse effects of the development, subdivision, or use of contaminated land. This function requires land suspected or known to be contaminated to be investigated and remediated if necessary, prior to authorisation of future use.

Key indicators

- Number of sites on the LLUR (and categories)
- Number of contaminated site reports audited
- Number of sites meeting the definition of 'contaminated'

THE IMPORTANCE OF CONTAMINATED LAND MANAGEMENT

Contaminated land is defined in the Resource Management Act 1991 (RMA), as amended in 2005, as land of one of the following kinds:

- (a) if there is an applicable national environmental standard on contaminants in soil, the land is more contaminated than the standard allows; or
- (b) if there is no applicable national environmental standard on contaminants in soil, the land has a hazardous substance in or on it that –
 - (i) has significant adverse effects on the environment; or
 - (ii) is reasonably likely to have significant adverse effects on the environment

Under the RMA, regional councils have the function of investigating land for the purposes of identifying and monitoring contaminated land. Regional councils and territorial authorities are also responsible for preventing or mitigating any adverse effects of the storage, use, disposal, or transportation of hazardous substances.

To meet the legislation, Chapter 4 of Environment Canterbury's proposed Natural Resources Regional Plan (PNRRP) includes Policy WQL11, which sets out a framework for collecting, managing and releasing information, assessing the risks and managing the adverse effects from contaminated land.

The Ministry for the Environment's HAIL has been incorporated into the PNRRP as Schedule WQL3. Environment Canterbury has a long-term aim to have identified and registered all sites in Schedule WQL3 within 10 years of the PNRRP becoming operative. Sites will be registered on the LLUR, which is an electronic database used to store and manage information about contaminated sites in Canterbury.

The following Table 12.1 outlines the environmental results anticipated by the community.

Table 12.1 Anticipated environmental results for contaminated land management

Reference	Anticipated Environmental Outcomes
The Long Term Council Community Plan (LTCCP) 2006-2016	
Waste, hazardous substances and contaminated sites	<ul style="list-style-type: none"> • Environment, in general, is to be looked after • Business and farming activities do not harm the environment
The Regional Policy Statement 1998	
Chapter 7.4 (3) Environmental results anticipated	<ul style="list-style-type: none"> • Reduced adverse effects from land contamination
Chapter 17.4 (1) Environmental results anticipated	<ul style="list-style-type: none"> • Reduced actual and potential effects on the environment from the storage, use, disposal and transportation of hazardous substances
Chapter 17.4 (2) Environmental results anticipated	<ul style="list-style-type: none"> • Better management practices adopted when hazardous substances are used
Proposed Natural Resources Regional Plan 2004	
Environmental results anticipated WQL8(a)	<ul style="list-style-type: none"> • Within two years of the notification of this chapter, Environment Canterbury has in place administrative procedures to exchange or provide information on contaminated land
Environmental results anticipated WQL8(b)	<ul style="list-style-type: none"> • All land where activities listed in Schedule WQL3 have occurred or are occurring has been identified, registered on the Listed Land Use Register, and an assessment of the potential risk to the environment, using national procedures for screening contaminated land, has been completed

RESOURCES

Land may be contaminated in a number of ways, but mainly as a result of the manufacture, transport, storage, use or disposal of hazardous substances. Industrial and commercial activity is the predominant cause of land contamination, but agricultural and residential land uses or activities can also contribute to contamination.

A number of current and historic activities that are or were required by law involve the application of hazardous substances. Examples include historic requirements for sheep dipping, use of treated timber in building and construction, and spray regimes in horticulture to eliminate pests.

Everyday activities can also contribute to land contamination. These include, for example, the increasing consumption of petroleum products as a result of industrial processes, and the use of private and commercial motor vehicles. Storage and delivery of petroleum products present a risk of land contamination.

PROCESSES

The reason many of these activities and industries have caused land contamination, is largely due to the nature of the hazardous substances involved. Many of the chemicals historically used for mandatory dipping and spraying of livestock, for example, are persistent in soils. They also have significant adverse effects on health and the environment.

Contamination in one area can often be mobilised and, thus, spread contamination to another area of soil, sediment, air, or water.

In particular, natural processes, including rainfall, can mobilise contaminants in soil which can lead to contamination of groundwater. This process is termed a passive discharge and is considered to contravene the RMA unless authorised through a resource consent. Rainfall also results in stormwater run-off, which can contaminate other areas of land and surface water due to the mobilisation of contaminants in dissolved or particulate form.

Poor management practices and insufficient regulation of hazardous substance use, storage and disposal often leads to an increased risk of substance release into the environment. For example, the oil industry typically supplies petroleum products to service stations, truck stops, transport depots, and building heating units through the filling of above-ground and underground storage tanks. This creates a risk of leakages and spills, and poorly maintained containment systems can fail, posing a significant risk to groundwater quality.

Other major sources of land contamination include dump sites and landfills, which are the predominant method of domestic waste

disposal in Canterbury. Historically, landfills were constructed without any impermeable liner beneath the waste pit or method of leachate collection system, and were inadequately capped following closure. As rainfall infiltrates the landfill and the waste breaks down, the resulting leachate is able to move through the soils beneath the landfill, potentially affecting groundwater quality.

Older, closed landfills also pose a risk when they are redeveloped without appropriate management measures. Some municipal dump sites that were closed many years ago have since been redeveloped for residential housing, which can present land stability risks, as well as the possibility of landfill gas exposure and direct exposure to contaminated soils (an example of a large municipal dump site in Christchurch that has been redeveloped for residential housing is discussed in Case Study 12.1).

Authorities now have greater controls on landfill design through the consenting process in the RMA. This generally means that newly-constructed municipal landfills will have an impermeable liner installed at the base of the pit to prevent the downward migration of contaminants, and a leachate collection system. At the end of their life, they must be closed appropriately in order to allow the safe escape of landfill gas, to limit the infiltration of rainfall, and to prevent direct exposure to the landfill contents.

The demand for land has meant that many sites once used for activities that have caused contamination, are now being redeveloped for more sensitive land uses. In these cases, it is necessary for the land to be investigated to determine the risk it may pose to human health or the environment, and for these risks to be managed.

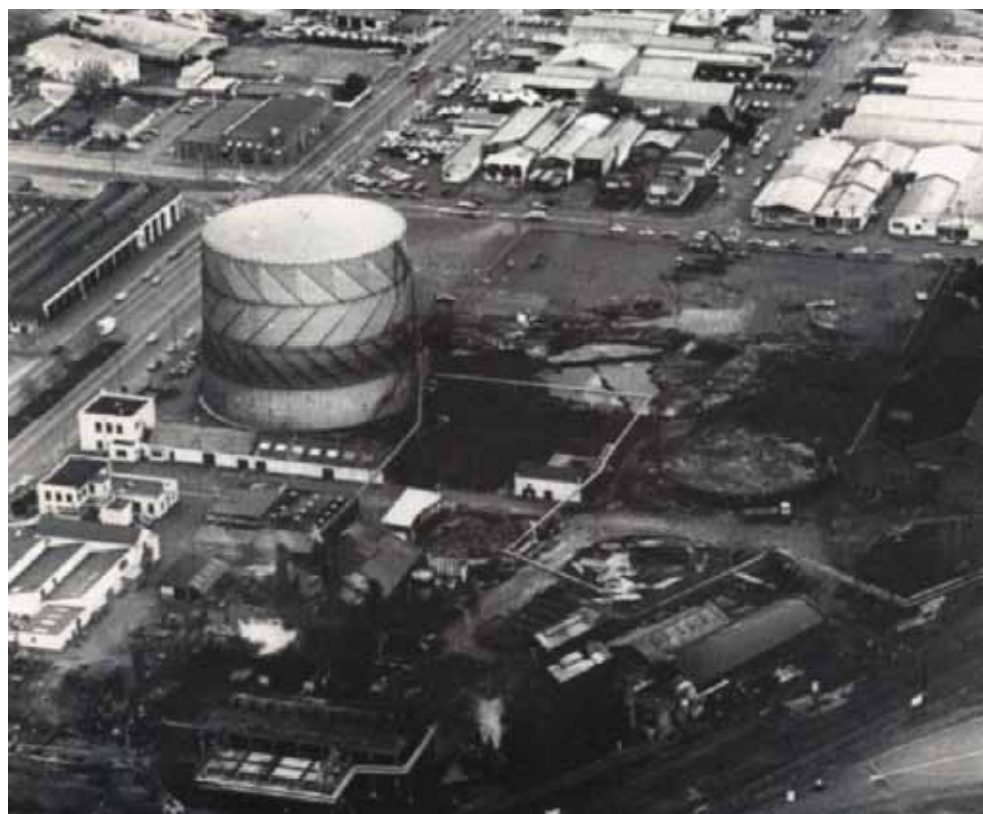


Figure 12.2 Former Christchurch Gasworks

OUTCOMES

The manufacture, use, storage and disposal of hazardous substances in Canterbury has resulted in areas of land, groundwater and sediment that are contaminated at concentrations above background levels.

Understanding the extent of the problem is difficult, as the numbers of sites accommodating HAIL activities has not yet been determined. The Listed Land Use Register currently has over 3300 sites registered; however, the proportion of all HAIL sites that this represents is unknown. The numbers of sites registered in each category are presented in Figure 12.1. The categories are defined as:

Unverified HAIL

The relevant land-use history has not been confirmed. The site has been reported as one that appears on the Hazardous Activities and Industries List, but the reported use has not been confirmed.

Verified HAIL – Not Investigated

The site has not been investigated. This category is for sites for which it is known that an activity or use as defined in the HAIL has taken place on the site, but there is insufficient information to characterise any risks to human health or the environment from those activities undertaken on the site. Contamination may have occurred, but should not be assumed to have occurred.

Verified non-HAIL

The site has been entered on the register based on information that subsequently was found to be incorrect. Information held at the time of the listing showed that the site had never been associated with any of the specific activities or industries on the Hazardous Activities and Industries List.

Partially Investigated

The site has been partially investigated. Investigations have been conducted that –

- (i) demonstrate that there are hazardous substances present at the site; however, there is insufficient information to quantify any adverse effects or risks to people or the environment; or
- (ii) do not adequately verify the presence or absence of contamination associated with all HAIL activities that are and/or have been undertaken on the site

Managed

The site has been investigated. Investigations demonstrate that there are hazardous substances present at the site in concentrations that have the potential to cause adverse effects or risks to people and/or the environment. However, those risks are considered managed because –

- the nature of the use of the site prevents human and/or ecological exposure to the risks; and/or
- the land has been altered in some way and/or restrictions have been placed on the way it is used which prevent human and/or ecological exposure to the risks

At or below background concentrations: The site has been investigated or remediated. The investigation or post-remediation validation results confirm that there are no hazardous substances above local background concentrations. Local background concentrations are those that occur naturally in the area. The investigation or validation sampling has been sufficiently detailed, in terms of locations sampled and analytes tested, to characterise the site.

Below guideline values

The site has been investigated. The investigation sample results demonstrate that there are hazardous substances present at the site, but indicate that any adverse effects or risks to people and/or the environment are considered to be so low as to be acceptable. The site may have been remediated to reduce contamination to this level, and post-remediation validation samples confirm this.

Contaminated:

The site has been investigated. Results demonstrated it is land of one of the following kinds:

- (a) if there is an applicable national environmental standard on contaminants in soil, the land is more contaminated than the standard allows; or
- (b) if there is no applicable national environmental standard on contaminants in soil, the land has a hazardous substance in or on it that –
 - (i) has significant adverse effects on the environment; or
 - (ii) is reasonably likely to have significant adverse effects on the environment (s2 RMA 1991)

Significant adverse environmental effect

The site has been investigated. Results demonstrated that sediment, groundwater or surface water contains hazardous substances that –

- (i) have significant adverse effects on the environment; or
- (ii) are reasonably likely to have significant adverse effects on the environment

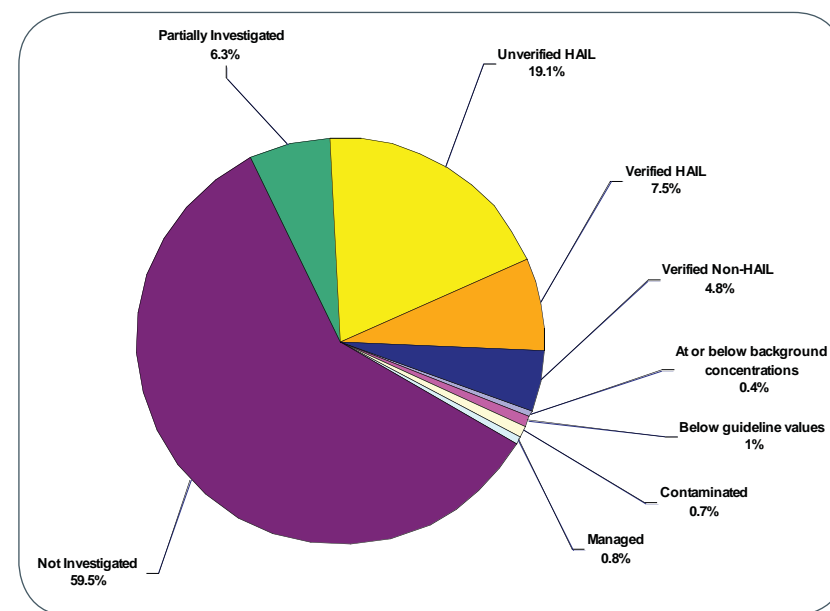


Figure 12.1 Sites on the Listed Land Use Register at 30 June 2008

HAZARDOUS ACTIVITIES AND INDUSTRIES LIST

This Hazardous Activities and Industries List defines industries and activities which typically use or store hazardous substances that could cause contamination if these substances escaped from safe storage, were disposed of on the site, or were lost to the environment through their use.

The fact that an activity or industry appears on the list does not mean that hazardous substances were used or stored on all sites occupied by that activity or industry, nor that a site of this sort will have hazardous substances present in the land. The list merely indicates that such activities and industries are more

likely to use or store hazardous substances and, therefore, there is a greater probability of site contamination occurring than other uses or activities. Conversely, an activity or industry that does not appear on the list does not guarantee that the site on which it was located will not be contaminated. Each case must be considered on its merits, considering the information at hand.

In applying the list, it must be remembered that the activity may only have occupied a small part of the site, and, therefore, the possibility of contamination will also be for a small part of the site.

- Abrasive blasting
- Acid/alkali plant
- Adjacent sites
- Agrichemical spray contractor's premises
- Airports
- Analysts-commercial analytical laboratory sites
- Any other facility that stores, uses or disposes of hazardous substances
- Asbestos products production and disposal
- Asphalt or bitumen manufacture or bulk storage
- Battery manufacture or recycling
- Brake lining manufacturers, repairers and recyclers
- Cement or lime manufacturing
- Cemeteries
- Chemical manufacture, formulation and bulk storage such that land use consent is required
- Coal and coke yards
- Concrete manufacture and bulk cement storage
- Defence work and defence establishments
- Drum and tank reconditioning or recycling
- Dry cleaning plants
- Electrical transformers
- Electronics
- Engine reconditioning
- Explosive production and bulk storage
- Fertiliser manufacture
- Foundry operations
- Gasworks
- Gun, pistol or rifle ranges
- Iron and steel sites
- Landfill sites
- Livestock dip or spray race operations
- Market gardens, orchards, glasshouses
- Metal treatment or coating
- Mining and extractive industries and mineral processing
- Motor vehicle works
- Paint manufacture and formulation
- Pest control
- Pesticide manufacture and formulation
- Petroleum or petrochemical industries or storage
- Pharmaceutical manufacture
- Port activities
- Power stations and switchyards
- Printing
- Railway yards
- Sawmills
- Scrap yards
- Service stations
- Smelting/refining
- Storage tanks and drum storage for fuel, chemicals and liquid waste
- Tannery, fellmonger or hide curing
- Transport depots
- Waste storage, treatment and/or disposal including land disposal of wastes
- Wood treatment and preservation and bulk storage of treated timber
- Wool, hide and skin merchants

RESPONSES

The lack of a complete register of all HAIL sites in the region is one of the key issues for contaminated land management in Canterbury. Environment Canterbury has a long-term environmental objective that within 10 years of the PNRRP becoming operative, it will have identified and registered all sites that have accommodated HAIL activities. Other responses, as detailed in Table 12.3, will ensure that landowners and other council staff have access to current contaminated land information. The implementation of regional rules and policy will ensure that the adverse effects of hazardous substance use, storage and disposal are minimised. Environment Canterbury will continue to work with central and local government to ensure that a nationally consistent approach to contaminated land management is achieved. Responses to contaminated land issues in the region are summarised in Table 12.3 below.

Table 12.3 Responses to pressures on contaminated land

Issue	Investigations & Monitoring	Policy & Planning	Regulation & Enforcement	Advocating & Education
Land, groundwater and sediments are contaminated at concentrations above background levels	<ul style="list-style-type: none"> Investigating potentially contaminated sites – regional investigations (eg background concentrations of contaminants in soils project) Applications to the Contaminated Sites Remediation Fund to investigate/remediate sites Verifying and auditing contaminated site reports 	<ul style="list-style-type: none"> Contaminated Land Management Strategy Contaminated Land Information Management Strategy Involvement with national guideline development PNRRP Chapter 4 - framework for managing information and assessing risks relating to contaminated land (WQL11) 	<ul style="list-style-type: none"> Rules in the PNRRP Resource consent processing, monitoring and enforcement (discharges, hazardous substance storage) Pollution Hotline – responding to spill incidents 	<ul style="list-style-type: none"> Providing information through property enquiries Contaminated-sites webpage on the Environment Canterbury website Production of fact sheets Auditing of reports – providing assessment to site owner
The LLUR is incomplete	<ul style="list-style-type: none"> Identification of Hazardous Activities and Industries (HAIL) sites Applications to the Contaminated Sites Remediation Fund to identify sites Procedure for registering sites on the Listed Land Use Register 	<ul style="list-style-type: none"> Contaminated Land Management Strategy Contaminated Land Information Management Strategy PNRRP Chapter 4 - framework for managing information and assessing risks relating to contaminated land (WQL11) 	<ul style="list-style-type: none"> Rules in the PNRRP Resource consent processing, monitoring and enforcement (discharges, hazardous substance storage) 	<ul style="list-style-type: none"> Development of web-based system to allow TA staff to query LLUR for information Meeting with contaminated land practitioners and stakeholders

CASE STUDY 12.1

Sandilands Landfill, Christchurch

Contaminated Sites Remediation Fund application

The former Sandhills Reserve Landfill, now referred to as Sandilands, is located in a residential suburb in East Christchurch. The landfill operated between 1870 and 1944, and residential development began in 1947. The development comprises 99 residential properties and a housing complex.

Of these properties, 12 are owned by Christchurch City Council (CCC). In 2001, the CCC investigated their properties to determine whether or not residents' health was at risk from elevated concentrations of soil contaminants originating from the landfill.

The investigation revealed that four of the CCC-owned properties had soil contaminant concentrations that exceeded environmental acceptance criteria for a residential land use. Those properties were remediated in 2001.

A further six properties not owned by CCC were also investigated, and five of those six properties were also found to have soil contaminant concentrations exceeding relevant environmental acceptance criteria.

In February 2004 an application was made to MfE's Contaminated Sites Remediation Fund, for assistance to investigate the remaining residential properties and the housing complex within the boundary of the former landfill. Funding was approved, and the investigation was carried out between July and September 2004.

The results of the investigation revealed that 12 properties required remediation. In January 2006, funding was approved to conduct remedial works at those properties, and that work has now been completed.



CASE STUDY 12.2

Residential subdivision, Kaikoura district

Remediation project

A residential subdivision site, located south of Kaikoura, was previously farmland with two former sheep dips and a holding yard on site. The owner of the property made an application to the Kaikoura District Council to subdivide the land into residential allotments.

At the owner's request, an initial investigation was undertaken to determine the possible extent of sheep dipping chemical residues remaining in the soils surrounding the former dips. The investigation identified two areas with unacceptable levels of arsenic and dieldrin, and recommended that further investigations be carried out.

Further site investigations defined the contaminated area, and presented remedial options. The subdivision consent application was publicly notified and subsequently granted, with conditions requiring the development of a site management plan to manage the risk posed by residual sheep dipping chemicals.

In consultation with Environment Canterbury and the district council, the site owner undertook remedial works to prevent residents' exposure to the soils that had become contaminated in the vicinity of the sheep dips. A site management plan was produced, which further manages the risks posed by the residual contaminants. The site has now been deemed acceptable for residential use.