

# Managing risks associated with land contamination

Guidance for councils





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## Acknowledgments

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- Potentially Contaminated Land: General Practice Note, June 2005.

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- Environment Protection Authority (EPA) Victoria
- City of Darebin.

Julie Eichner (*Project Manager “Managing risks associated with land contamination”*) of the Environmental Health Unit wishes to express her appreciation to all those who assisted in the development of this document.

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Users of this document should, where necessary, seek expert advice on managing their contaminated site issues.

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Feedback on the guideline is welcomed.

## Foreword

When soil contains elevated levels of metals or other substances, it does not automatically mean a human health risk exists. However, there is heightened public awareness of the potential for soil contamination, especially in areas where children stay or play. To manage these situations consistently, effectively and transparently, councils should develop policies and procedures specific to their municipality to deal with potentially contaminated sites. Careful planning and early community engagement are essential.

These guidelines provide the tools to assist your council in developing a policy and procedure for effectively managing contaminated sites.

The Environmental Health Unit of the Department of Human Services developed this document in consultation with the Office for Children (of the Department), and the Land and Groundwater Unit of the Environment Protection Authority (EPA) Victoria. The aim of the document is to facilitate a consistent approach by councils in assessing, managing and communicating risk-related issues, following an investigation of potential land contamination.

This information can assist council staff involved in managing contaminated land and associated issues, including property or asset managers, media and community relations professionals, environmental health practitioners and town planners, as well as managers of community facilities.



**DR ROBERT HALL**

Director, Public Health and Chief Health Officer



## Quick reference guide

- Develop a contaminated land policy incorporating an effective community engagement and risk management strategy.
- A soil assessment will often reveal some level of contamination. However, in many cases, it can be managed in a way that does not require widespread clean up. Preventing or minimising human exposure to the soil is often the main issue to consider when managing these situations. A potential health risk will only exist if there is human exposure to the contaminated soil.
- The requirements under the planning system generally only come into effect when there is a proposal for a change of land use or development
- DHS Office for Children has developed guidelines that set out the requirements for both proposed sites of children’s services and sites of existing licensed children’s services. Specific criteria determine whether a soil assessment is required.
- Where council plans to carry out soil assessment of a site they own or manage:
  - > Choose a reputable environmental consultant with experience in land contamination.
  - > Specify the following within the contract conditions or tender specifications:
    - The site investigation will be carried out in accordance with the following: National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPM); AS 4482 Part 1 (2005) and Part 2 (1999); State Environment Protection Policy (SEPP) for Prevention and Management of Contamination of Land.
    - The reports will provide conclusions on the risk of possible harm, or detriment to beneficial uses of the land.
    - Where there are potential health risks, the reports will identify a range of options to manage them effectively.
    - If the initial findings of an investigation reveal contamination of concern, an interim report will be provided. This includes advice on interim measures to prevent further exposure, until the detailed assessment report and health risk assessment (HRA) is completed.
  - > Council’s project leader should consult with other relevant areas of council—property management, planning, community services, environmental health, building and engineering, PR and communications. This allows the appropriate areas of council:
    - to be informed of what is happening
    - to assist with the overall process.
- **For more advice:**
  - Environment Protection Authority (EPA) Land and Groundwater Unit, or the relevant EPA region—information on environmental site assessment reports, audits and remediation options, interpretation of technical information.
  - Department of Human Services Environmental Health Unit—health risk communication and interpreting technical information.
  - Where the site is occupied by a licensed children’s service, contact the Regional Children’s Services Adviser.

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## 1. Background

### 1.1 The need for contamination assessment

‘Land contamination’ means that chemical substances or waste are present in the soil at levels above what would be expected to occur naturally. This represents a potential or actual risk to health or the environment. It often happens as a result of current or historical activities at, or adjacent to the site.

From the late 1880s through to the early 1900s, it was common practice in inner urban areas to level new sites and limit potential floods by importing soils, sometimes from industrial sites. Accepted household activities, such as emptying fireplace coals and ash directly into backyards, have also added to the mixture of contaminants found in soil and gardens of inner urban properties.

Outer urban or rural land contamination is less common, but still occurs as a result of past activities in the general area (such as pesticides used in farming or arsenic from gold mining), or previous site-specific activities (for example, a former petrol station).

Discovering contaminants in soil does not automatically mean a site is dangerous to health. Soils naturally contain minerals and levels may be above what is normally expected, without necessarily meaning the soil is dangerous to health.

One key question to answer is: *Based on an investigation of the degree (level) and extent (spread) of soil contamination, is this site suitable for its intended use?*

Children spend considerable time at a range of facilities owned or operated by councils, so it is important they are not unnecessarily exposed to soil contaminants. Young children can become exposed when playing outside, particularly by putting dirty hands in their mouths. A small number of children will actively eat soil.

### 1.2 Responding to contamination issues

Some councils have investigated, or are in the process of investigating all their community facilities for soil contamination, as part of ongoing due diligence.

Soil investigations carried out by councils can also be triggered by:

- planning requirements (for example, developing a site for a sensitive use)
- children’s services requirements (for example, renovations to an outdoor playground involving deep excavation of soil)
- a specific issue being raised (such as a complaint or awareness of a potential problem).

A soil assessment will often reveal some level of contamination. However, in many cases, it can be managed in a way that does not require widespread clean up. Preventing or minimising human exposure to the soil is often the main issue to consider when managing these situations.

### 1.3 Purpose of this guide

The Department of Human Services produced this guidance document in consultation with the Environment Protection Authority (EPA) Victoria, to assist councils in assessing, managing and communicating health risk issues about sites that may contain soil contaminants.

More specifically, the document provides guidance to councils that carry out soil investigations of potentially contaminated land they own or manage. This information may also be useful for councils involved with contaminated land issues associated with privately owned land, for example residential properties.

In brief, this document presents:

- **an overview of site contamination assessment**—triggers for investigation and response, stages of the investigation, early engagement of stakeholders, requirements for assessing land, identifying risks to health or the environment and managing these risks
- **advice on municipal site contamination policies**—what to consider before commencing soil investigations, reducing unnecessary concerns, and developing a contaminated land policy specific to the municipality

- **guidance on community engagement and risk communication**—including strategies for community involvement and consultation, communicating the results and explaining risk in a non-technical manner
- **information on selecting a consultant and developing the consultant's brief**—the difference between consultants and auditors, selection criteria, investigation reports and options for managing contamination to control identified risks.

The Appendices contain:

- a **technical supplement** for municipal environmental health officers, providing more detail on site investigations (preliminary and detailed, and health risk assessments)
- **fact sheets** for community members and council staff, summarising key risk communication information in a non-technical way.

## 2. Relevant legislation, policies and measures

The EPA is the lead government agency in Victoria for land contamination issues.

The *Environment Protection Act 1970* and the *State Environment Protection Policy (Prevention and Management of Contamination of Land) 2002* (SEPP) contain the requirements and processes applicable in Victoria, interlinked with the *Planning and Environment Act 1987*.

The *Children's Services Act 1996* provides for the licensing and regulation of children's services and is administered by the Department of Human Services. The *Occupational Health and Safety Act 1985* requires that assessments be carried out in a safe manner—the site safety assessor has this responsibility (see section 8.3).

### 2.1 NEPM (Assessment of Site Contamination)

The NEPM (National Environment Protection Measure) 1999 was developed under the *Commonwealth National Environmental Protection Council Act 1994*. The Act established the National Environment Protection Council (NEPC), to ensure that people enjoy the same level of protection from pollution, wherever they live in Australia.

The NEPC makes measures in writing, known as national environment protection measures. The measure for assessing site contamination provides a nationally consistent approach which ensures sound environmental management practices by regulators, site assessors, environmental auditors, landowners, developers and industry.

The NEPM is available from the NEPC via [www.ephc.gov.au](http://www.ephc.gov.au) or by phoning (08) 8419 1200.

### 2.2 SEPP (Prevention and Management of Contamination of Land)

The *State Environment Protection Policy (Prevention and Management of Contamination of Land) 2002* (SEPP) brings together all matters relating to land contamination, including responsibilities for its prevention and management. SEPP's establish a principle of shared responsibility for all levels of Government, industry, business and people of Victoria.

The goal is to maintain—and where appropriate and practicable, improve—the condition of the land, to protect current and future beneficial uses by:

- preventing contamination of land
- where pollution has occurred, adopting management practices that will ensure unacceptable risk to human health and the environment are prevented and the pollution is cleaned up, or otherwise managed.

Part IV of the SEPP states that the EPA considers the following objectives<sup>1</sup> when determining whether contaminants at any site pose an unacceptable risk to protected beneficial uses<sup>2</sup>:

*Contamination must not cause an adverse effect on human health and the level of any indicator (substance or contaminant) must not be higher than:*

- investigation levels specified in the NEPM (Assessment of Site Contamination) for both human health and environmental factors*
- levels derived using a risk assessment methodology described in the NEPM.*

This does not mean that if the level of a contaminant is above the (specified or derived) level that triggers investigation, that this is unacceptable, or that a risk to health exists. For more details, see section 4 of this document (Investigation and response levels).

Clauses 13 and 14 of the SEPP clarify the obligations of planning and responsible authorities considering planning permit applications and planning scheme amendments. Section 3.3 of this guideline also provides some details on how potentially contaminated land is managed within the planning system.

The SEPP is available from the EPA, via [www.epa.vic.gov.au/about\\_us/legislation/sepps.asp](http://www.epa.vic.gov.au/about_us/legislation/sepps.asp), or by phoning (03) 9695 2722.

1 Objectives in Table 2—Indicators and Objectives for Land, *State Environment Protection Policy (Prevention and Management of Contamination of Land) 2002*.

2 Beneficial uses of land protected by the SEPP: maintenance of natural and modified ecosystems; human health; buildings and structures; aesthetics; and production of food, flora and fibre.

## 3. State and local government involvement

### 3.1 Department of Human Services

#### Office for Children

Under the *Children's Services Act 1996*, the Department of Human Services considers whether the design and location of premises intended for a children's service is satisfactory for that purpose. This includes land, premises or proposed premises, or any proposed alterations or extensions to an existing facility.

The department has developed soil assessment guidelines<sup>3</sup> for applicants and licensees of children's services, and guidelines for environmental consultants, presenting key information for licensed children's services. The guidelines set out the requirements for both proposed sites of children's services and sites of existing licensed children's services. Specific criteria determine whether a soil assessment is required.

For a site to be approved for use as a children's service, the environmental consultant doing the soil assessment must sign off that the site is appropriate for its intended use (and not a risk to children's health), by completing the *Children's Services Soil Assessment Summary Report*. The department will use the information in this report, together with comments from other experts, in deciding whether to grant an application (and to define any conditions or restrictions that may apply to the children's service licence).

Access to these guidelines to determine whether a soil assessment is required, and further information is available via [www.dhs.vic.gov.au/csguidelines](http://www.dhs.vic.gov.au/csguidelines) under 'practice notes', or by phoning your Department of Human Services Regional Children's Services Adviser.

<sup>3</sup> The children's services guidelines refer to "soil assessment" as opposed to "site assessment", the term used throughout this document. "Soil assessment" is used to ensure that the children's services guidelines refer to assessment of soil only (and not other parts of the site). However, for consistency with the NEPM, this document for councils refers to "site assessment". Both terms have the same meaning, in that the soil at a site is assessed for contamination.

#### Environmental Health Unit (EHU)

The department's Environmental Health Unit (EHU) assists the Office for Children with technical matters relating to human health and potential land contamination issues.

The EHU also offers professional advice to councils on communicating public health risk relating to site contamination. This can help councils manage issues associated with reports of land contamination, especially sensitive use sites<sup>4</sup> such as children's services or residential estates/areas, where land may have been previously owned by council, or where widespread contamination occurred as a result of industry.

In certain cases, EHU and the EPA will work with council to assist in communicating risk. For assistance with health risk communication relating to children's service sites, contact your Regional Children's Services Manager in the first instance.

### 3.2 Environment Protection Authority

Under the *Environment Protection Act 1970*, the EPA has a general responsibility to ensure protection of the Victorian environment. This includes protecting specified 'beneficial uses', including "public benefit, welfare, safety, health and aesthetic enjoyment".

The EPA may require action if a site is giving rise to pollution off-site, or where the condition of the site is not suitable for its current use. This may include further investigation and/or remediation works, or a statutory environmental audit. If an audit is required, it must be performed by an environmental auditor (contaminated land), appointed by the EPA.

The Statutory Environmental Audit System is administered by the EPA, under the *Environment Protection Act 1970*. More information is available on the EPA website, [www.epa.vic.gov.au](http://www.epa.vic.gov.au), and in the following publications:

- *Environmental auditing of contaminated land*, EPA publication 860
- *Potentially Contaminated Land: General Practice Note* (available at [www.dse.vic.gov.au/planning](http://www.dse.vic.gov.au/planning)).

<sup>4</sup> 'Sensitive use' is defined under the SEPP as land used for residential use, a child care centre, a pre-school centre, or primary school as defined in Minister's Direction No.1, under section 12(2)(a) of the *Planning and Environment Act 1987*.

### 3.3 Local government

#### Council as the land-owner

If a site owned by council has contaminated soil and is a potential public health risk, then council is responsible for rectifying the potential hazard. They may also be responsible for contaminated sites previously owned and subsequently divested, unless a certificate of environmental audit was issued, indicating that the site was suitable for the relevant beneficial uses<sup>5</sup>.

Under the *Children's Services Act 1996*, the proprietor of a children's service must ensure that every reasonable precaution is taken to protect the children from any hazard likely to cause injury. As the licensee, councils must ensure that the service is operated in a way that ensures the safety of children being cared for or educated.

Careful planning is required before carrying out a site investigation—it is not as simple as engaging an environmental consultant and waiting for their assessment report.

#### Council as the Planning or Responsible Authority

The planning system is the primary means for regulating changes in land use and approving development. It is also an important mechanism for triggering an investigation into potentially contaminated land (*Potentially Contaminated Land: General Practice Note, June 2005*). The requirements under the planning system generally only come into effect when there is a proposal for a change of land use or a development.

In accordance with s. 12(2)(b) and s. 60(1)(e) of the *Planning and Environment Act 1987* and the SEPP, planning and responsible authorities must consider:

- (1) any significant effects which the amendment, use or development may have on the environment
- (2) any potential contamination of land at the site, and any significant effects that contamination may have on any proposed amendment, use or development.

Council must ensure that the site is suitable for its proposed use. Adequate information must be provided by the applicant on the existing potential for contamination to have future adverse effects, to enable planners to make an informed decision.

Where the land is to be rezoned, *Ministerial Direction No. 1—Potentially Contaminated Land*, requires planning authorities when preparing planning scheme amendments, to satisfy themselves that the environmental conditions of land proposed to be used for a sensitive use, agriculture or public open space are, or will be suitable for that use. If the land is potentially contaminated and a sensitive use is proposed, *Direction No. 1* provides that a planning authority must satisfy itself that the land is suitable through an environmental audit.

Where approving a planning permit would allow potentially contaminated land to be used for a sensitive use (including a residential site or a children's service), the responsible authority requires a **Certificate of Environmental Audit** or a **Statement of Environmental Audit**, in order to satisfy itself that the land is suitable for the proposed use. These requirements are set out in Part 14 of the SEPP<sup>6</sup>. For more information on the level of assessment necessary, refer to the *Potentially Contaminated Land: General Practice Note* (DSE, June 2005).

In some circumstances an Environmental Audit Overlay (EAO) may cover the land. The EAO indicates that a decision has been made that the land is potentially contaminated and is unlikely to be suitable for a sensitive use without further assessment and remediation. The EAO requires that an environmental audit be undertaken. All buildings and works associated with a sensitive use (irrespective of how minor) will trigger the need to undertake an environmental audit. However, the EAO does not prevent works or activities being undertaken that are associated with an environmental audit (such as soil sampling). (*Potentially Contaminated Land: General Practice Note, June 2005*)

<sup>5</sup> Whether a council is deemed responsible depends on various factors, including whether it can be established if council was responsible for the contamination.

<sup>6</sup> The *SEPP for the Prevention and Management of Contamination of Land* clarifies the responsibilities of land occupiers and managers in preventing contamination. It also sets standards and processes to ensure that potentially contaminated sites are assessed and, where necessary, cleaned up or managed so that they are suitable for their proposed use.

## 4. Investigation and response levels

### 4.1 Investigation levels

An **investigation level** is the substance concentration *above which* further investigation and evaluation is required. Investigation and evaluation will determine:

- typical concentrations of site contaminants
- extreme concentrations of site contaminants
- horizontal and vertical distribution of site contaminants
- physicochemical form of contaminants
- bioavailability of contaminants (how easily it is taken up by the body).

It is important to note the following information on health investigation levels (HILs) and ecological investigation levels (EILs):

**HILs and EILs are NOT cleanup or response levels, nor are they desirable soil quality criteria.** They are to be used for assessment of existing contamination only and are intended to prompt an appropriate site-specific assessment when they are exceeded. Inappropriate use of investigation levels as default remediation criteria may result in unnecessary remediation adding to development costs, causing unnecessary disturbance to the site and local environment, and potential waste of valuable landfill space. Similarly, it is an abuse of investigation levels if they are interpreted as condoning contamination to these levels. Land is usually remediated to an extent which optimises current and future land use.

Site-specific health and ecological assessment should be conducted where exceedance of investigation levels indicates there is the likelihood of adverse effects on human health or ecological values for that site.

*(extract from NEPM Schedule B1, p. 4)*

The NEPM Schedules B1 and B7 list HILs for a range of substances, land uses and exposure scenarios. For sensitive land uses, such as standard residential settings and children's services, the appropriate HILs are those under the HIL-A category. These levels are based on conservative assumptions to protect a young child living on the site. HILs have also been set for alternative exposure settings where there is limited access to soil, or reduced time in the setting for young children. HIL-D relates to residential settings with minimal opportunities for soil access. HIL-E covers parks, recreational open space and playing fields. HIL-F applies to commercial and industrial settings.

When interpreting the results of a soil analysis, reference should be made to the investigation levels in NEPM Schedules B 7(A)—Guideline on health based investigation levels, and Schedule B 7 (B)—Guideline on exposure scenarios and exposure settings. Schedule B 7(B) includes summary information for each substance that has a HIL. This includes basic toxicity information.

Levels in excess of the relevant HIL do not always imply unacceptability, or potentially significant health risk. A **site-specific health risk assessment** (HRA) may then be required to determine the presence, nature and degree of risk. Final assessment should take into account any uncertainties arising from either the sampling method or analytical approach used.

### 4.2 Response levels

A **response level** is defined as the *concentration of a contaminant at a site, for which a response is required to protect public health and/or the environment*. Some consultants refer to response levels as 'site-specific criteria'. Consultants sometimes develop response levels by adapting the relevant HILs to be site-specific. **Different response levels are derived from different exposure scenarios. A response level is intended for use for a specific site (ie for a specific exposure scenario). Obvious health effects would not be expected until contamination levels are well in excess of response levels.**

See Appendix A for a detailed explanation of how response levels are derived.

The required response will depend on the risk associated with a given contamination level. Where the risk is assessed as relatively low, the response may simply involve informing site occupants so that they are aware of hazards arising from, for example, pica behaviour in children (eating substances such as dirt). Where there is a relatively high risk, soil remediation (for example, soil replacement or treatment) may be required.

The response will be modulated by many factors, including:

- current land use
- potential for child occupancy
- potential environmental effects, including leaching of contaminants into groundwater
- the history and nature of the contamination (including local background levels)
- presence of single versus multiple contaminants
- depth of contamination
- level and distribution of contaminants
- toxicity and bioavailability of contaminants
- physicochemical properties of contaminants
- state of the site surface—is it paved, grassed, tan-barked with lining, or exposed bare soil?
- potential exposure pathways
- uncertainties with sampling method/toxicological assessment.

**Investigation and response levels should not be interpreted rigidly.** Proposed land use and distribution of contaminants will have a significant bearing on interpretation of the results. These factors—and the other points above—should be considered when assessing the environmental or health significance of levels of contamination above an investigation level.

Applying investigation and response levels to site management is guided by the risk management process, in turn driven by technological, social, political and economic factors.

An information sheet on HILs is provided as an example for the general public (See appendix C).

## 5. Developing a contaminated land policy

To effectively assess and manage potentially contaminated sites in a consistent manner, council should develop its own policy.

Some councils have progressed and completed an assessment of all their sensitive use sites, including children's services (child care centres, kindergarten and occasional care services), community health centres, park playgrounds and neighbourhood houses. Effective communication and consultation are the keys to success. Concerns or questions that arise from parents and the broader community during the assessments must be dealt with in an open, accurate and informed manner.

If council decides not to survey the sites they own and manage—or if this process may be considered at a later stage—a general contaminated land policy still should be developed. This ensures that site assessments or environmental audits resulting from legislative requirements (for example, under planning or children's services requirements), are done in a well managed manner. The policy should also cover council's involvement with (or how council will manage) other contaminated land issues that may become evident, such as pockets of existing residential neighbourhoods.

Any contaminated land policy needs to encompass community engagement issues and be developed by engaging relevant stakeholders, including council staff, other government agencies, the community and the media. It should also address the circumstances under which a community service might be considered for closure (refer to section 6.3.3).

Where children may be potentially exposed, it is good to adopt a precautionary approach to soil management. Include in your policy that any bare soil areas in the play areas of children's services must be covered with an adequate barrier and properly maintained (well maintained grass is acceptable). This will prevent human exposure to potentially contaminated soils. If a soil assessment is carried out later, any substances identified will be unlikely to be accessible to humans, therefore the health risk will be lower.

Some Councils have already developed soil contamination policies. The City of Yarra's *Community Safety and Management of Soil Contamination Policy* is one example of a policy that was developed in consultation with the community. It is publicly available on their website at: <http://www.yarracity.vic.gov.au>

Whatever section of council is responsible for coordinating the assessment, other relevant areas—rates, records, environmental health, town planning, building, engineering, media/public relations—should be consulted before engaging a contractor to commence the preliminary investigation. These areas of council may be able to provide useful information (such as compiling a site history—see section 6.2.1) that could form the basis of the preliminary investigation, potentially reducing consultants' fees.



## 6. Site assessment

A site assessment determines whether soil contamination poses an **actual** or **potential** risk to human health or the environment, of sufficient magnitude to warrant remediation or management.

Two forms of assessment may be used:

- (1) site assessments, conducted by a suitably qualified environmental professional (consultant)
- (2) statutory environmental audits, undertaken by an environmental auditor under the *Environment Protection Act 1970*. The outcome of an audit is either a Certificate of Environmental Audit or a Statement of Environmental Audit. (See Section 8.2).

Site assessments should be performed in accordance with the NEPM (Assessment of Site Contamination). This is divided into:

- **Schedule A**—a flowchart outlining the recommended stages for assessment of site contamination (see Figure 1 on page 14)
- **Schedule B**—a range of guidelines providing more detail on the assessment of site contamination process.

A site assessment usually begins with a preliminary assessment, which may then lead to a detailed assessment, with or without a site-specific health risk assessment (HRA). Site assessments may proceed directly from one stage to the next, due to the complexity of the site and the discovery of unexpected contamination. A different process is followed if a statutory environmental audit is required.

Where a statutory environmental audit is necessary it must be performed in accordance with the *Environmental Auditor (Contaminated Land) Guidelines for Issue of Certificates and Statements of Environmental Audit (EPA Publication 759b)*. Environmental audits provide a high level of assurance as the auditors must be independent and are responsible to EPA and the people of Victoria.

It is important to understand the general process of assessing and managing site contamination and, in particular, the risk assessment and risk management components. It is also important to understand when an environmental audit may be required rather than a site assessment (Refer to section 6.4).

### 6.1 Planning a site assessment

Before selecting an environmental consultant and developing the brief, consider the information in section 8.

If council decides to undergo a survey of all sites, they should do so in a staged manner. Land used for sensitive purposes, such as children's services, with the highest potential for contamination and/or exposure, should be targeted first.

Planning and communication are essential before taking any soil sample and sending it off to be tested. Community engagement is central to the process of assessment and management of site contamination. Avoid concurrent assessments if possible, as issues may become difficult to handle should a complex situation arise, especially if the sites are controversial or sensitive. Other council owned sites include community centres, maternal and child health centres, scout halls and playgrounds.

The following table categorises typical council sites, from highest to lowest priority for assessment (extract from the City of Darebin's draft soil contamination management policy).

**Table 1** Prioritising site assessments

Priority for assessment	Criteria/land use
1 (Highest priority)	<ul style="list-style-type: none"> <li>• The site is occupied by preschool children/infants for extended periods of time. For example: child care centres, kindergartens.</li> </ul>
2	<ul style="list-style-type: none"> <li>• The site is used by preschool children/infants on a regular basis for short periods of time. For example: playgrounds, maternal and child health centres.</li> </ul>
3	<ul style="list-style-type: none"> <li>• The site is used as a recreational reserve, park, or sporting ground.</li> <li>• The site is used by sporting and community groups on a regular basis. For example, community halls, sports grounds, recreational centres.</li> <li>• The site has social, cultural, financial or political significance. For example: senior citizens centres, town hall, libraries, pioneer settlements.</li> </ul>
4 (Lowest priority)	<ul style="list-style-type: none"> <li>• The site has commercial and industrial uses. For example, council depots, transfer stations, business centres.</li> </ul>

Where a preliminary assessment of priority sites identifies a higher possibility of elevated substances being found, further investigation of those sites should be progressed first.

A higher possibility of substances being found at elevated levels in soil exists when it is identified that (a) historic uses of the site may have resulted in soil contamination, and/or (b) changes in land use conditions indicate potential for contamination. This can be found during review of historical records, interviews with relevant people (which may include the local community), and site inspections.

Sections 6.2.1 and 6.2.2 provide further guidance on initial steps to identify whether land is potentially contaminated (including site history investigations), and particular land uses that indicate potential contamination.

Before undertaking an investigation, council staff should understand:

- general principles of the NEPM, including the steps involved in assessing sites for contamination
- how people may (or may not) be exposed to contaminated soil
- how to interpret the guidance values, such as HILs.

Two key schedules of the NEPM are the Guideline on Health Based Investigation Levels (Schedule 7A) and the Guideline on Exposure Scenarios and Exposure Settings (Schedule 7B).

Two quick reference documents (enHealth 2001) explaining HILs for various substances, and exposure scenarios and settings, can be obtained from the Commonwealth Department of Health and Ageing website, on [www.health.gov.au](http://www.health.gov.au), or by emailing [phd.publications@health.gov.au](mailto:phd.publications@health.gov.au). These publications were incorporated into Schedule 7 of the NEPM.

## 6.2 Undertaking a site assessment

### 6.2.1 Identifying potentially contaminated land

*(adapted from NEPM Schedule B 2 and Potentially Contaminated Land: General Practice Note)*

Initial steps to identify whether land is potentially contaminated:

- Confirm whether an Environmental Audit Overlay (EAO) exists over the site.

- Review lists of any Statements of Environmental Audit held by council and EPA. Environmental auditors are required to provide a copy of any Certificate or Statement issued to both the relevant council and EPA.
- Review the EPA Priority Sites Register for information about sites with a current EPA notice (for example, clean-up notice or pollution abatement notice) via Landata ([www.land.vic.gov.au](http://www.land.vic.gov.au), phone: (03) 8636 2456), or Anstat ([www.anstat.com.au](http://www.anstat.com.au), phone (03) 9278 1172).
- A site history and inspection should also be carried out. To identify the potential for contamination, basic information about the site in question is needed:
  - site history investigations
  - review of local geology and hydrogeology
  - site inspections to confirm site history and identify additional site information required.

It is essential that the site's exact location and the significant features involved in its contamination history are accurately and clearly identified.

#### Site history

A site history should contain all available information which can assist in identifying the nature and extent of site contamination. It includes the following:

- site plan—a current plan of the site, with scale bar, indicating the site orientation (including north) and general contours of the property, local water drainage and other environmentally significant features, as well as a locality map and a series of aerial photographs (where relevant), with dates.
- current and previous zoning, ownership, occupiers or activities carried out on the site (for example, council, rail, other utility or defence). Council rates records are a useful record of this information. Note that zoning may indicate past land uses, but is not a substitute for a detailed review of the site history.
- for previous activities/uses, identify raw materials used and wastes produced from industrial processes. In addition, identify: any waste disposal locations on the site; discharges and/or spills to land and water; chemical storage areas. Any information on earthmoving activities carried out on the site will assist in determining the source of any imported fill.

- any previous investigations or site assessments conducted.
- any potential contamination from surrounding land uses (for example, an adjacent service station known to be causing off-site contamination).

Sources of information for compiling a site history include:

- past and current site owners, operators or workers
- council and EPA records
- local knowledge of residents
- aerial and ground-level photographs
- past involvement with government agencies or consultants
- trade and street directories
- historical societies and local or state government libraries
- historical titles back to original deeds
- local literature, including newspapers
- technical literature, including, plumbing and building permits/plans, flammable and combustible liquid storage and handling licences
- complaint history and information from environmental licences and trade waste permits held by council or other authorities
- geological survey maps
- council development approval records, sewer and underground service plans
- site layout plans.

Recollections and anecdotal records should be cross-checked where possible and the limitations of the data noted. The source from which all site history information was sought, successfully or otherwise, should be described.

### Site inspection

A site inspection is necessary to confirm aspects of the site history and to identify any additional site information that may be relevant. Observe evidence of contamination or historical activities that may give rise to contamination (for example, fuel tanks, stained soils or evidence of substances which may indicate potential hazards, such as asbestos, coal, tar or ash).

## 6.2.2 Land uses/activities indicating potential contamination

(Source: *Potentially Contaminated Land: General Practice Note, June 2005*)

Particular types of current or past land uses or activities on a site can act as a ‘trigger’ for the collection of more information. The following lists show the type of land uses that may have contamination potential.

### High potential

- abattoir
- abrasive blasting
- airport
- asbestos production/disposal
- asphalt manufacturing
- automotive repair/engine works
- battery manufacturing/recycling
- bitumen manufacturing
- boat building/maintenance
- breweries/distilleries
- brickworks
- chemical manufacturing/storage/blending
- cement manufacture
- ceramic works
- coke works
- compost manufacturing
- concrete batching
- council depot works
- defence works
- drum re-conditioning facility
- dry cleaning
- electrical component manufacturing
- electricity generation/power station
- electroplating
- explosives industry
- fibreglass reinforced plastic manufacture
- foundry

- fuel storage depot
- gasworks
- glass manufacture
- iron and steel works
- landfill sites/waste depots
- lime works
- metal coating
- metal finishing and treatments
- metal smelting/refining/finishing
- mining and extractive industries
- oil or gas production/refining
- pest control depots
- printing shops
- pulp or paper works
- railway yards
- shooting or gun clubs
- scrap metal recovery
- service stations/fuel storage
- sewage treatment plants
- ship building/breaking yards
- shipping facilities—bulk (rate <100t/day)
- stock dipping sites
- spray painting
- tannery (and associated trades)
- textile operations
- timber preserving/treatment
- tyre manufacturing
- underground storage tanks
- utility depots
- waste treatment/incineration/disposal
- woolscouring.

### Medium potential

Medium potential for contamination may be identified where the following activities, which may be incidental to the main land use, were conducted on the site. The nature of the products used, or stored, the quantity and the location of use or storage should be considered.

- chemical storage
- fuel storage
- underground storage tank (if recently installed and no evidence of leaks)
- market gardens
- waste disposal
- filling (imported soil)
- other industrial activities (such as warehousing of chemicals that may be spilt during loading or unloading).

### Low potential

This is likely if none of the identified uses or activities listed above are known to have been carried out on the land.

## 6.2.3 Preliminary site investigation

A preliminary investigation should identify whether contamination exists or is likely to exist on the site. This includes:

- establishing a site history (including review of prior potentially contaminated land use)
- detailing the current (or proposed) use of the site
- reviewing local geology and hydrogeology
- conducting a site inspection.

In conducting the site history and inspection, pay attention to the presence of naturally elevated levels of potentially harmful substances, potentially contaminated fill, or any offensive odours from the site.

Initial sampling and analysis of a limited range of substances may be undertaken to confirm the initial findings (that is, the likelihood of contamination).

If there is any uncertainty about the potential or extent of contamination, the investigation will proceed to a more detailed site assessment. Generally, potential or actual contamination will usually require further definition. However, if limited contamination is identified at this stage of the investigation, and if there is enough information, a remediation or management strategy may be devised and implemented to control any potential health risk.

**The preliminary investigation may conclude:**

- the soil at the site is unlikely to be contaminated and unlikely to pose a risk to human health
- OR
- the soil at the site is contaminated, or there is a likelihood of contamination, so a more detailed site investigation is needed (involving more sampling)
- OR
- guidance values are exceeded for some substances, and there is enough information to devise a remediation/management strategy to control the potential health risk. This should be specified in an environmental management plan (EMP). EMPs are described in more detail under section 6.3.2

### 6.2.4 Detailed site investigation

A detailed site investigation is required when the results of the preliminary investigation do not provide enough information to develop a management plan for the site.

Potential contamination may be indicated by the presence of unexpected underground structures—for example, fuel or chemical storage tanks—or by stained soil or imported fill (ash, odorous material or refuse). Actual contamination may be detected in the form of contaminants that are not naturally occurring, or as elements or compounds that are naturally occurring, but are above the level expected.

A detailed site investigation involves taking more samples across the site and at deeper soil levels, to characterise the extent and location of any contamination. Any soil sampling strategy needs to consider whether the samples taken adequately represent potential exposures for the site. This also applies to soil sampling conducted at the preliminary stage.

Soil test results are compared against guidance values called health investigation levels (HILs) or ecological investigation levels (EILs). If levels are above these values, this **does not** automatically mean that people using the site are at risk. It does, however, trigger the question of whether further assessment is required (site-specific HRA), or if a management strategy can be put in place to control the potential health risk.

**The detailed investigation may conclude:**

- the soil sample results did not exceed the relevant NEPM HIL criteria<sup>7</sup> AND the investigation also indicates that there is no evidence of an unacceptable risk to human health, or an offensive odour associated with the site.
- OR
- If the soil sample results exceed the HIL criteria for nominated substances and/or there is evidence of an unacceptable health risk, the consultant may:
- devise a remediation/management strategy to control the health risk [these measures should be specified in an EMP], or conduct a site-specific health risk assessment.

### 6.2.5 Site-specific health risk assessment

The HRA is specific to the site and the proposed use for that site. It is used to determine whether adverse health effects are likely to result from exposure to the soil contamination.

There are two components to the HRA—a **hazard assessment** and an **exposure assessment**. These need to be completed so that the risk can then be characterised.

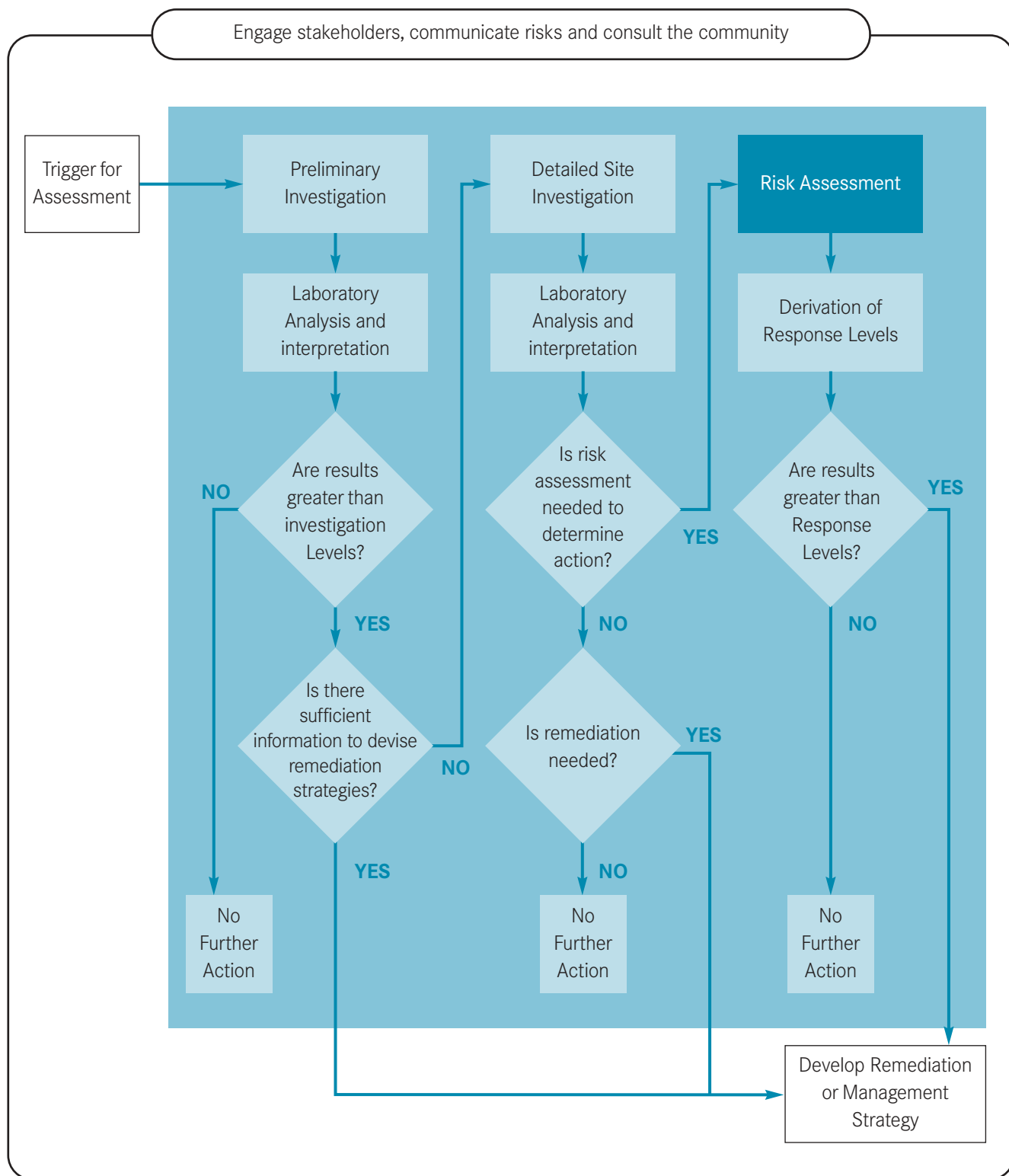
A risk assessment may be a relatively quick process for simple issues, or a detailed complex process which may result in ‘response levels’ being generated.

The HRA report should summarise key risk information (nature and likelihood of adverse health effects), evaluate uncertainty, identify strategies to manage any identified risk (including recommendations for managing actual and potential health risks), and provide key information for risk communication. The risk management decisions will then be determined by council.

<sup>7</sup> See Appendix A for a technical explanation of HIL criteria.

**Figure 1: Recommended general process for assessment of site contamination**

(Based on Schedule A of NEPM)



The consultant’s recommendations can range from providing information to site users, local residents or owners about the contamination, to providing adequate barriers<sup>8</sup> to exposed soils or requiring partial or wide-scale soil remediation (for example, replacement of contaminated soil with clean soil or using special types of bacteria to break down the contaminants and clean the soil). Soil management strategies (for example, soil replacement and/or provision and maintenance of soil barriers) are to be specified in an EMP.

A site-specific HRA will not always be necessary if the issues are ‘obvious’ and the environmental consultant is able to recommend strategies to manage the contamination at an earlier stage. With complex circumstances, a site-specific HRA often becomes very expensive and time consuming.

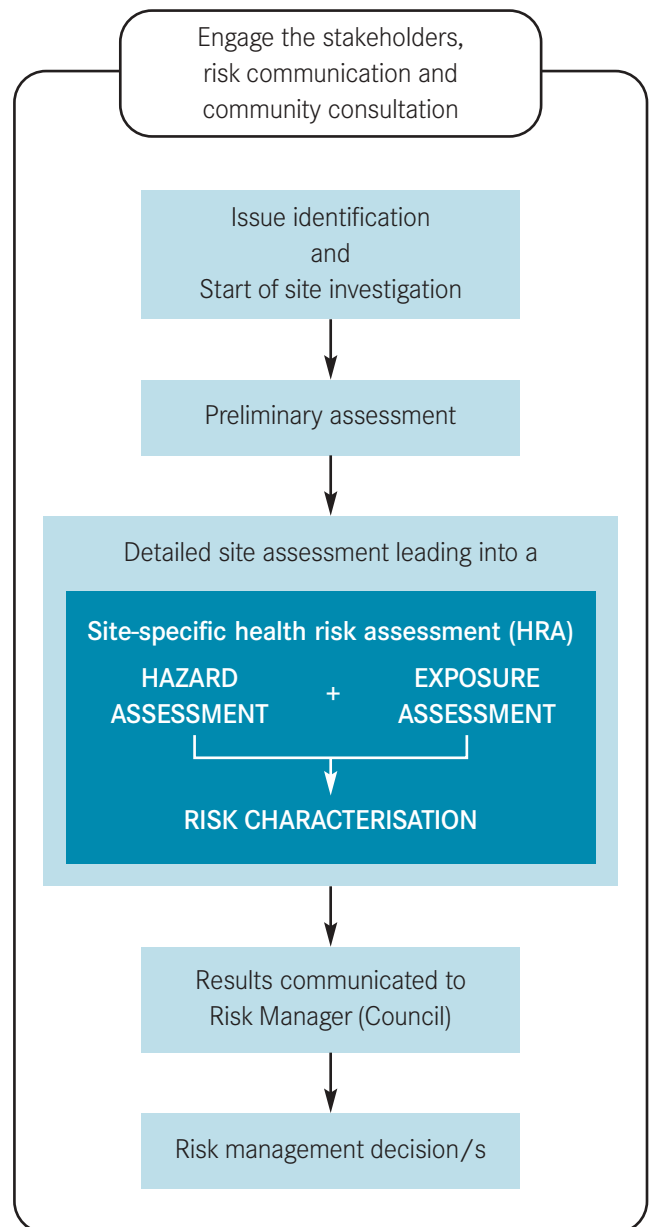
**A site-specific HRA may then conclude:**

- that the substances present are not at levels harmful to health (which may include levels that are below the response levels or site-specific criteria)
- AND/OR**
- that implementing remediation/management measures specified in an EMP will control the potential health risk.

See Appendix A for a technical supplement, providing more information on:

- the stages of a site investigation and expected outcomes (of preliminary and detailed site assessments, and site-specific HRA)
- what stage an assessment will generally be taken to (for example, when a site-specific HRA is warranted).

**Figure 2: Risk assessment process for contaminated sites<sup>9</sup>**



8 Types of soil barriers include paving, concrete, grass and tanbark. Grass barriers need to be maintained to ensure bare patches of dirt do not cause exposure. With tanbark, an adequate layer should be spread and, depending on the situation, it is often preferable to have a lining between the bark and soil.

9 Adapted from (a) Figure 4-11 of the NEPM and (b) the ‘enHealth Guidelines for Assessing Human Risks from Environmental Hazards 2002’. Hazard and exposure assessments are described in Appendix A.

## 6.3 After the assessment

### 6.3.1 Risk management decision/s

Risk characterisation describes the risks to individuals and populations in terms of nature, extent and severity of potential adverse health effects.

The characterised risk (as determined by the consultant) should not be the only information used by council in choosing which risk management options to adopt. Council should make informed risk management decisions after evaluating the environmental health, economic, social and political aspects of the management options.

Relevant sections of council should be consulted prior to deciding on the risk management strategy—the basis of decision making should be clearly documented.

Action must then be taken to implement the remediation or management strategy. Where children occupy an assessed site (for example, children's services), any remediation required must be conducted during weekends and/or holiday periods, when children are not present.

Sometimes it is necessary to separate the children from potentially contaminated soil areas, until the degree of risk is assessed. The consultant may recommend this as a precautionary measure, during the early stages of an investigation.

No soil sampling plan, however exhaustive, can eliminate the possibility that contaminants are present on a site. However, this does not necessarily mean that a site with potentially elevated levels of contaminants will require remediation to the extent of replacing most soils. In many cases, this approach will not be cost-effective or practical when balanced against the risk. Risk assessment is based on probabilities rather than absolutes and this should be reflected in decision making.

The extent of remediation depends on the level of contamination and actual and potential human exposure. The consultant will make a health risk assessment, based on the sampling results and exposure factors. If a risk is identified, the consultant will provide appropriate management options and recommendations.

### 6.3.2 Environmental management plans

Any remediation/management strategy devised by the consultant (resulting from either the preliminary or detailed investigation) should be detailed in an environmental management plan (EMP). The EMP should also state the following:

**Implementation of the EMP will minimise the risk of any possible harm or detriment to the relevant beneficial uses of the land environment (and in particular, to minimise the risk to health in the context of the site's current or proposed use).**

Council may sometimes want a second opinion, for example, when:

- the level of contamination is very high
- there is some doubt as to whether an EMP or other information received is appropriate
- council would like an additional level of certainty, or independent review.

Where council requests a second opinion in relation to an EMP, it is recommended that an environmental auditor (appointed under the Environment Protection Act) is engaged to review the assessment conducted. This is a good way to verify that the consultant has conducted an adequate assessment. NB: environmental consultants are not regulated, but EPA-appointed auditors are.

If an environmental auditor is engaged, they should confirm that the consultant's EMP will minimise the risk of any possible harm or detriment to the relevant beneficial uses of the land environment.

It should also be noted that the site owner (or proprietor, in the case of a children's service) will be responsible for ensuring that the EMP is adhered to. More specifically, the proprietor of a children's service must ensure that every reasonable precaution is taken to protect the children from any hazard likely to cause harm.



### 6.3.3 Closing a community service

If elevated levels of certain substances are found by the site investigation, carefully consider whether an actual health risk exists. The level of risk depends on the actual hazard and the level of exposure. In particular, the risk depends on:

- the levels of the substances found in the soil
- whether that soil is accessible, that is, are people exposed?
- the age of the people who are exposed
- whether interim measures can be put in place to prevent exposure (for example, placing of a barrier such as rubber matting, or restricting access to the certain areas).

A health risk does not necessarily exist if Health Investigation Levels (HILs) are exceeded. In the case of children's services, contact the DHS Regional Children's Services Adviser and the EPA for advice on whether a community service should be closed.

This information is considered during the soil investigation process (often at the HRA stage). However, it is useful for council to understand these issues prior to deciding on the risk management options.

The characterised risk should not be the only information used for the risk management decision. Community consultation is another integral part of risk management (enHealth 2002). A situation will never present 'zero' risk. For example, if a children's service is closed down and the health risk is negligible, this can take the public's perception of the risk out of context.

The investigation will consider the age groups of occupants at a site, for example, children who attend children's services, their access to outdoor play spaces and the length of time spent at the site. This is because babies and young children, particularly in the six months to two-year-old age group, are more susceptible to the effects of exposure to contaminated soil. They typically consume more dust and soil than older children and adults<sup>10</sup>, and their bodies are smaller. Therefore, the dose of contaminants they receive is comparatively large.

In most cases, however, infants in a child care centre are not allowed to crawl outside on bare ground (dirt). It is also unlikely that a baby learning to walk is placed alone outside in the yard of a child care centre. Therefore, it is unlikely that infants are exposed to potentially contaminated land in these settings. Children attending kindergarten from age 3 and up, spend more time in the outside environment. However, children of this age are less likely to eat soil than younger children, and kindergartens normally have an active "wash your hands" policy.

In addition, it is important to note that Children's services holding a restricted licence may not even have access to an outdoor space.

## 6.4 When might a statutory environmental audit be required?

Where land has been identified as being potentially contaminated, an assessment is necessary before a decision is made about the future use or development of that land (*Potentially Contaminated Land: General Practice Note, June 2005*).

An assessment may also be warranted in cases where no change is proposed to current land use. This is particularly important for sensitive use sites.

### 6.4.1 Sites where no change is proposed to current use

A statutory environmental audit may be required in cases where:

- a preliminary or detailed site assessment indicates contamination beyond the site boundary
- there are very high levels of contamination
- the condition of the site is not suitable for its current use
- an additional level of certainty and independent review is required.

<sup>10</sup> Young children consume more dirt because they get dust or soil on their hands when they crawl or play on the ground. They then often put their dusty or dirty fingers or toys in their mouths. Some young children also eat small handfuls of soil.

EPA may require a statutory environmental audit to be conducted, or the land owner (for example, council) may decide that it is warranted (after collating a preliminary review of the site history, or even after engaging an environmental consultant). Where the land owner has engaged an environmental consultant to conduct a site assessment, the consultant may also advise on the need for an audit on all or part of the site. If in doubt, contact the EPA for advice.

In addition, where an Environmental Audit Overlay (EAO) covers the land and that land is already used for a sensitive use, any new buildings or works proposed (irrespective of how minor) will trigger the requirement for a statutory environmental audit under the planning system. The audit must be conducted before any buildings and works associated with the sensitive use can be undertaken.

#### 6.4.2 Sites proposed for new sensitive uses

As outlined in section 3.3, the requirements under the planning system generally only come into effect when there is a proposed change of land use or development.

A statutory environmental audit is generally required in accordance with clause 14 of the SEPP, where a planning permit application would have the effect of allowing potentially contaminated land to be used for a sensitive use (including child care centres and residential premises).

Table 2 of the *Potentially Contaminated Land: General Practice Note* (June 2005), indicates the appropriate assessment level to determine whether land is potentially contaminated and whether an environmental audit is required. The table highlights that a statutory environmental audit should be required for sensitive uses, where there is a high potential for contamination (refer to section 6.2.2 for land uses with a 'high potential'). Where there is insufficient information available to determine if an audit is appropriate, the table indicates that a site assessment should be conducted. Where the site assessment indicates that the land is potentially contaminated then an environmental audit should be required.

## 7. Community engagement and risk communication

Risk communication is part of risk management and encompasses the whole assessment process, from when an issue is first identified, through to each stage of the site assessment. This is also the case for engaging stakeholders and community consultation.

Strong community engagement and risk communication strategies are essential. Objectives should be clearly defined, with the concerns of specific groups identified and addressed. Accepting the community as a stakeholder and partner is a key principle of risk communication.

Liaising with other agencies (for example, the EPA and Department of Human Services), establishes a good source of reliable, credible information and advice. The EPA and EHU (Department of Human Services) can help councils develop information to communicate specific environmental and health risks.

Risk communication for sensitive use sites is especially important. For assistance relating to children's services, contact the regional Department of Human Services Children's Services Adviser. The council environmental health officer could also be involved.

In addition to the information in this section, see:

- Schedule B8 of the NEPM for further guidance on community consultation and risk communication
- sample fact sheets in the Appendices, summarising essential information for stakeholders
- *Responding to Environmental Health Incidents—Community Involvement Handbook, enHealth Council, National Public Health Partnership, 2006.*

Depending on current levels of internal expertise, council staff may need further training on risk communication.

### 7.1 What the communication plan needs to address

The communication plan should address each of these elements:

- **Purpose**

Why do you need to communicate: build credibility; meet legislative requirements; provide maximum opportunity for public involvement?

- **Target audience**

With whom do you need to communicate? Anybody who *perceives* they are affected should be given the opportunity to participate in the process. As the community is diverse, a range of messages and styles of delivery may be required.

- **Message**

What needs to be communicated?

- **Tools**

How will you communicate? For example, smaller informal meetings are often better than large impersonal meetings.

The more effective your council's risk communication process, the less chance of the affected community being 'outraged', or misinformed with unsubstantiated or misleading information provided by external sources, and the easier people will understand the pertinent issues. The way the public perceives risk can be described as:

**RISK = HAZARD + 'OUTRAGE'**

(Source: Sandman, Dr Peter M, 1993)

## 7.2 Involving the community— who, when and why

Members of the public with an interest in potentially contaminated sites need to be included early in the process, that is, at the **planning stage** of a site assessment. Inform interested parties of any potential risks identified, and what has been, or will be, done to mitigate such risks. This will help avoid unnecessary alarm and possible outrage at a later stage. Therefore, engagement will often commence before risks are identified and management options developed.

Community members can also make valuable contributions—such as providing different perspectives and local knowledge—and it is important to give them this opportunity. Never underestimate their level of technical knowledge. Councils should focus on informing the community, enabling their involvement throughout the whole assessment process. This means from the time an issue is identified, through to the risk management stage of a health risk assessment. In relation to children's services, committees of management, staff, parents and volunteers all have the right to be involved.

Community consultation can assist at each step of the risk assessment process. It may not always lead to consensus, but is likely to increase the validity of the risk management process (adapted from enHealth, 2002).

Early engagement encourages community trust and can identify problems much sooner. This is an essential part of achieving trust and credibility—it is much more difficult to allay people's fears or to correct misunderstandings, when their concerns become significant issues later on in the process. Once lost, trust is very difficult to regain.

At first contact, community involvement can provide a range of information about the site (such as site history), health concerns and potential value conflicts. A specific communication plan for the whole process can be prepared at this time, before a site assessment even commences. Information to be shared with the community can include:

- why a site assessment will be undertaken
- what the site assessment will consider
- how the site assessment will be performed
- how any identified risks will be managed (describe the process to be employed)

## 7.3 Communicating the results

Ensure that the results of both preliminary and detailed stages, together with any planned remediation work, are clearly communicated to the community.

Provide regular community information bulletins, from the planning stage to the final stages of site assessment and remedial action. People should be made aware that they may contact the council if they wish to view the full details (for example, the consultant's assessment report). At the end of a preliminary investigation, if further assessment is required, the community concerned should be made aware of this.

It is easier to explain the results once the investigation is complete, the final report is available and the risk is established, along with mitigation measures. However, if people request information on the preliminary investigation, it must be provided, even though the risk may not yet be established. The longer information is held back, the less trusting people will be.

Bulletins produced after the preliminary and detailed assessment stages should summarise the results in a straightforward way. Council's designated communications person should first consult with the environmental consultant, to ensure accuracy of content. The Department of Human Services and/or EPA can provide advice on interpreting and explaining technical issues in an easily understood format. This is especially important for more complex sites, or where there is heightened concern.

Information needs to be accurate, clear and consistent with advice provided by the Department of Human Services or EPA. Scientific details need to be explained simply, including terms such as 'health investigation levels' (many people understand these to be the 'safe' level or 'national standard'). See the Appendices for a community fact sheet on HILs.

The types and levels of substances found should be put into context. For example, elevated levels of lead is common in inner urban soil, as are elevated levels of arsenic in gold mining regions. However, just because a hazard exists does not necessarily mean a health risk exists—a person needs to be exposed to the hazard.

## 7.4 Explaining risk

Remember that the consultant's report will characterise the risk associated with a site assessment. However, it is equally important to understand how risk is established, expressed and perceived, especially when council needs to clearly communicate risk to the public. Communicating complex issues can be difficult, especially if the public's outrage factor is high, or if children or pregnant women are involved.

### 7.4.1 Perception of risk

There are three perspectives to 'risk'—actual, estimated and perceived (McKone and Bogen, 1991). The outcome of a risk assessment, with its uncertainties, is the estimated risk. The actual level of risk may never be accurately known, but all stakeholders will have their own perceptions. Good risk communication aims to align estimated and perceived risks.

The way the community generally interprets risk depends on several factors:

- the actual magnitude of risk
- public perception of that risk
- the nature of the hazard
- who is likely to be exposed.

Asbestos, for example, is a highly emotive topic. A parent who believes their child may be exposed to asbestos can create outrage, even if this is a single fragment that is found deep below the soil's surface. Young children are generally more sensitive to chemical exposures, but the community needs to understand how a hazard can become a risk. In the case of asbestos, the risk exists only if the fibres are breathed in.

### 7.4.2 Risk = hazard + exposure

This scenario illustrates how the level of risk depends on the hazard and the exposure:

**Hazard:** A contaminant (hazard), such as lead, is detected at a concentration above the Health Investigation Level. The lead is found below the soil's surface and the ground has an adequate barrier (for example, well maintained grass, or a good layer of tan-bark).

**Exposure:** A two-year-old child who plays in this yard will not be exposed unless he or she digs down to the contamination. The deeper the contamination, the less likely exposure will occur, especially if the ground is very hard. If the contamination is deeper than the first 30 cm of soil, then it is a reasonable assumption that, in general, a child will not dig beyond that depth<sup>11</sup>.

**Risk:** A risk will only then exist if the child eats soil contaminated with lead. The child would first need to dig through the ground's cover (for example, grass or sand and sandpit barrier).

The level of risk will depend on:

- age of the person
- distribution and concentration of the substance in the soil
- how much of the contaminated soil is eaten (or depending on the substance, how much is breathed in and/or absorbed through the skin)
- the form of the contamination
- how bio-available it is (how readily it is taken up by the body).

In many cases, the level of risk will only be significant if a young child eats many handfuls of soil; this is uncommon except when a child has a condition known as 'pica'.

<sup>11</sup> This could be different in a sandpit, as it is much easier to dig. However, a child would need to dig down past the sand to reach the soil layer. Note that if an intact barrier between the sand and soil exists, exposure to the soil will be minimised.

### 7.4.3 How risk is expressed

The level of risk can be described either **qualitatively** (by putting risks into categories such as ‘high’, ‘medium’, or ‘low’) or **quantitatively** (with a numerical estimate). Sometimes consultants use ‘acceptable risk’ factors. The figure of one in one million has been used by the USEPA for interpreting the ‘acceptable risk’ of developing a form of cancer. However, explaining risk in this manner can become complicated, as the perception of risk will vary greatly.

Current risk assessment methods do not enable accurate quantitative estimates of risk for low levels of exposure to environmental hazards. Numerical estimates of risk are rarely feasible, due to limitations in toxicological and exposure data. Some parts of the risk assessment process, such as the exposure assessment, may be (at least in part) quantitative (enHealth, June 2002).

### 7.4.4 Communicating characterised risk

The consultant will provide key information for risk communication. If the risk is expressed numerically, decide how this information is best presented to the community.

Estimates do not need to depend on numbers to be useful; ordinary language may be used to indicate the level of risk. A finely divided ranking system can give a relatively accurate indication of quantity without using numbers (ACDP, 1996).

A simple numerical estimate of risk—portrayed as the ‘real risk’—ignores the subjectivity and multiple dimensions of risk (Thomas and Hrudey, 1997). People see risk as multi-dimensional and not represented by a numerical value, so will judge it by its characteristics and context. For example, concerns around risk will generally be greater where they:

- affect children or pregnant women
- are involuntary or man-made
- are poorly understood by science
- cause dreaded health effects, such as cancer
- are contradicted by other agencies or the media.

When explaining risk to the community, use a descriptive approach that explains the hazard and exposure relationship.

Take care when using comparative risks. For example, it is not a good idea to compare involuntary risks (such as being bitten by a dog whilst on a walk), with voluntary risks (such as the risk of breaking a leg from snow skiing), as people have differing perceptions of these types of risks.

### 7.5 Issues to consider when communicating risk

The following is adapted from USEPA’s seven cardinal rules of risk communication:

#### • LISTEN to the public’s specific concerns

When listening to people’s concerns, do not assume what people know, think or feel. In addition, the level of technical knowledge held by community individuals must never be underestimated. Everyone who has an interest in the issue at hand should be allowed an opportunity to be heard. Empathy should be shown when listening; the community’s concerns may be understood more easily if it is imagined that you are the concerned parent or individual.

#### • Be HONEST and OPEN and FRANK at all times

Honesty and openness is important and it is essential that the risk is not exaggerated or minimised. If people request information on a site assessment, it should be provided to them. Lack of information will result in some people assuming the worst case scenario. This will start rumours and misinformation that will take a lot of time and resources to correct, especially once they reach the media. Generally, the greater the uncertainty about an issue, the greater the concern, and the more open council should be. As a rule of thumb, it is better to share more, not less information.

Questions from the community need to be answered quickly, otherwise the information will be sought elsewhere (including journalists). If council does not have all the answers, commit to getting back to people with answers *in a given timeframe*.

### • Speak CLEARLY and with COMPASSION

When expressing risk, remember that delivery and tone may have more impact than the actual content. Body language, tone, eye contact, listening skills, what is said and what is not said—all have an impact on the way risk is perceived. Choose a person with good communication skills to speak with the community at forums—the same person should write, or at least proofread, any information bulletins.

In communicating risk, use language that is simple to understand and avoid technical jargon. Acknowledge and respond to emotions expressed by the community—including anger, fear, outrage and helplessness. Discuss what council can do, what council will do, and what council can't do. It is imperative that council does whatever is promised.

## 7.6 Communicating with the media

Effective communication with the media helps ensure that issues are not taken out of context. Council should be accessible to the media, be open with information and respect their deadlines.

*The media is often interested in danger rather than safety, simplicity rather than complexity and politics rather than risk (Covello and Allen 1988).*

The following rules apply when speaking with the media:

- Tell the truth.
- Assume everything you say is 'on the record'.
- Do not say 'no comment'.
- Do not take questions personally.
- Use simple language.
- Remain calm at all times.
- Explain everything, but remain concise to avoid misrepresentation or editing.
- Provide a written summary of the information.

(from *Basic environmental health, WHO 1991*)

Designate a coordinator to manage communications between government and the community, including the media. This person should establish a long-term relationship of trust with local media contacts. Council's designated person should prepare in advance and provide their journalist contacts with background information on issues, then keep them informed of progress. This will be easier than trying to put things into context with community concerns heightened.

The media is the community's ally. If parents are outraged by not being informed fully of a children's service land assessment, the media will effectively disseminate their message. If the media has a trusted source, they will check facts before reporting and give council an opportunity to correct wrong information.

In cases where an issue is highly sensitive, or where community concerns are already heightened, council should coordinate with other agencies (EPA and Department of Human Services) before information is released to the media.

To reduce media pressure, it should be made clear that information will be released at set times. These deadlines must be adhered to, even if you need to say that the information is not yet available (for example, a final report).

## 8. Working with consultants

### 8.1 Selecting an environmental consultant

Engage an environmental consultant who is qualified and experienced in assessing land contamination. This will help ensure that site sampling, analysis objectives and any remedial actions are clearly established and appropriate. Consider using a tendering process, including specifications for suitable qualifications and experience.

The following selection guidelines are adapted from Queensland Environmental Protection Agency's guideline on selecting a consultant:

1. See telephone directory listings, under 'Environmental Consultants'. The Australian Contaminated Land Consultants Association (ACLCA) Victorian Branch (through [www.aclca.asn.au](http://www.aclca.asn.au) or telephone (03) 9509 5949) can provide contact details. The EPA also has a list of environmental auditors with expertise in contaminated land assessment ([www.epa.vic.gov.au/envaudit/auditors.asp](http://www.epa.vic.gov.au/envaudit/auditors.asp)).
2. Make a short-list of suitable consultancy firms from the telephone directory, ACLCA, EPA, or recommendations from other councils.
3. For the initial screening, ask short-listed consultants to provide information about their qualifications and project experience (Refer to NEPM Schedule B 10, which provides further information on competencies for contaminated land professionals).
4. Seek from each short-listed consultant a list of relevant completed projects. They may also have a list of clients whom you may contact to discuss the consultant's skills.
5. Request detailed cost estimates, ensuring that the scope of the work is clearly described. Also request the names, experience and level of involvement of other people or companies<sup>12</sup>. Applicants also need to demonstrate their experience in forming multidisciplinary teams for complex assessments.
6. Clarify the process for any work in addition to that specified in the original contract.

<sup>12</sup> In some cases, the consultant may sub-contract certain parts of the investigation or remediation work outside their area of expertise. For example, another consultancy may need to be engaged to carry out a health risk assessment. If this is the case, clarify who the subcontractors are, their role, and who will be supervising them.

### 8.2 Environmental auditors

In some cases, councils may need to engage an EPA-appointed environmental auditor, as well as an environmental consultant. The roles of environmental auditor and the environmental consultant are different. Environmental auditors need to be involved:

- when a Statutory Environmental Audit (resulting in either Certificate or Statement of Environmental Audit) is required by the Planning Scheme (an EAO applies to the land)
- when the EPA requires a Statutory Environmental Audit, for example, where a preliminary or detailed soil assessment indicates contamination beyond the site boundary and/or there are very high levels of contamination
- when an additional level of certainty and independent review is required
- when council is not satisfied with the consultant's assessment, or requires a second opinion. If in doubt, contact the EPA for advice.

### 8.3 Site safety assessors

(source: NEPM Schedule B(9))

Site safety assessors evaluate any potential risks to people or the environment during a site assessment. This should be organised by the council's chosen consultant. Before fieldwork begins, consider its potential impact on the surrounding environment and people present. Those affected include:

- site users and occupants
- those conducting the assessment, including sub-contractors
- other people working on the site
- visitors to the site
- people passing through the site
- site neighbours.



The site safety assessor must ensure that all risks to human health and the environment posed by the site's current condition (and imminent physical disturbance) are adequately addressed. These risks include:

- dealing with unknown substances
- deep excavations presenting a physical hazard
- release of volatile substances during excavations (or their pooling in excavations)
- generation of dust
- ground water surveys that may contaminate aquifers, if bores are not correctly drilled
- underground storage tanks that may cause subsidence if corroded, or fire and explosion hazards.

The site safety assessor is normally a professionally qualified engineer, occupational hygienist or scientist, with recognised experience in contaminated land assessment and a working knowledge and understanding of appropriate legislation, codes of practice and guidelines.

See Schedule B9 of the NEPM for guidelines on protecting human health and the environment during the assessment.

## 8.4 Developing the consultant's brief

The environmental consultant's assessment must be performed in accordance with the:

- *State Environment Protection Policy (Prevention and Management of Contamination of Land)*, made under the *Environment Protection Act 1970*
- National Environment Protection Measure for Assessment of Site Contamination (1999), including clear adherence to Schedules B1–B3 (and B4, if HRA conducted)
- Australian Standard AS 4482 Guide to the sampling and investigation of potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds (2005) and Part 2: Volatile substances (1999).

This will help ensure that the work is adequate and increases the reliability and consistency of conclusions made in the final reports.

### 8.4.1 What to include

Include the following points in tender specifications and contract agreements:

#### Overall

- 1) They will be required to carry out assessments in accordance with the NEPM and AS 4482. Where consultants sub-contract out specific areas of expertise, they should ensure that the sub-contractors conduct their specified work in accordance with relevant NEPM and AS 4482 schedules.

#### Specifically

- 2) Any soil sampling should include areas where human exposure is likely (for example, where children can access soil during play, including children's sandpits without an intact barrier between the sand and underlying soil). Surface samples are particularly important, as surface soil usually allows direct exposure. Council could require that the surface samples are analysed first.
- 3) Data presentation and reporting must have specific regard to Part 6 of Schedule B2 of the NEPM:
  - Site maps must be attached to reports for each assessment stage, indicating:
    - where samples have been taken (locations), the depths of each sample, sample identification numbers, and corresponding descriptions of the sample location areas. A short description could be along the lines of: 'Play area X is well grassed with no bare dirt areas'.
    - the areas and depths where soil contamination exceeds the relevant soil assessment guidelines.
  - Soil sample analytical results must be presented in tables in each relevant report and include:
    - all essential details, such as sample numbers and depths
    - soil assessment guidelines, highlighting any results in excess of levels.

Council could specify what they expect to receive at each stage of the investigation.

### 8.4.2 The consultant's report

Reports should be timely, comprehensive and clear in their content and conclusions. An accurate and timely site-specific HRA depends upon coherent and logically developed reports.

The report's scope and objectives should be clearly stated, and key findings highlighted in a brief executive summary. Quality assurance and quality control protocols for field and laboratory work should be documented in reports.

Where there is a series of reports—preliminary, detailed and HRA—each should summarise important and relevant points/results from the previous reports. This assists fast comprehension of new material by all parties involved. Results of soil samples tested should be provided in the reports (both at the preliminary and detailed stages), along with site maps to show where the samples have been taken.

**Councils should immediately reject reports that are unclear and confusing, or do not meet the requirements specified in the contract agreement.**

Part 6 of Schedule B2 of the NEPM provides the standardised formats for data presentation and reporting. In particular, it sets out the requirements for site drawings (including display of site features<sup>13</sup> and contaminant concentrations), report structure for soil analytical results and summary of statistical data.

A site map should be provided in the preliminary report, regardless of whether sampling was undertaken.

The consultant should provide a summary of statistics for each analyte tested, and for each layer of soil tested where there is a large enough sample size. For example, provide statistics for samples tested for chemical X that were taken from (a) the soil's surface, and (b) from each deeper layer. No single summary statistic (such as the arithmetic mean) can fully characterise a site. A range of summary statistics is needed, to provide the full picture and indicate whether HILs are met overall. The statistical summary includes arithmetic mean, standard deviation, and number of samples exceeding 2.5 times the HIL.

Tables 6-A and 6-C of the NEPM Schedule B 2 offer examples of what should be provided to aid interpretation of results.

<sup>13</sup> Site plans should be drawn to a scale, with north facing arrow and including (but not limited to) identification of boundaries with respect to roads and adjacent properties, and direction of surface run off and drainage.

### 8.5 Assessment conclusions and recommendations

Following a **detailed assessment**, the consultant should conclude whether the soil sample results exceed the relevant HIL criteria for particular substances<sup>14</sup>. Council should specifically request the consultant to state in their report, whether the relevant HIL criteria are exceeded (as outlined in Appendix A). If the soil sample results exceed the relevant HIL criteria, consider:

- whether the exceedances are minor, or relate to contaminants with low human toxicity and limited mobility. In these cases, it may be enough for the consultant to provide a qualitative risk assessment—a less lengthy and expensive process than a detailed site-specific HRA. This may lead to the implementation of a site EMP, to manage the risk.
- whether site-specific criteria or response levels should be developed (taking into consideration exposure factors specific to the site), as part of a detailed site-specific HRA.

However, the issues may be 'obvious' and the consultant may be able to recommend management strategies to control the potential risk. Council may then decide that it is better to implement the management strategy.

Councils should request that the consultant provide:

- at the detailed investigation stage, information on the following options (where criteria for HILs are not met):
  - (a) possible remediation/management strategies, with recommendations
  - (b) extending the detailed assessment to include a site-specific HRA.<sup>15</sup>
- an interim report, when it is known that environmental site assessment reports require additional time to complete (detailed site-specific HRA in particular), and if the previous findings indicate a potential for concern. An interim management strategy may be requested as a precautionary measure.

<sup>14</sup> See Appendix A for a technical explanation of HIL criteria.

<sup>15</sup> At the end of developing an HRA, the environmental consultant must provide advice on health risk (if any) from substances on the site, and options for any clean-up or management actions deemed necessary to control the potential health risk to the occupants of the site. These recommendations may cover actions required in the short term and/or in the long term.

- risk statements, incorporated into the report at the earliest possible stage (including preliminary reports)

Although an HRA cannot be made without sufficient analytical results, a preliminary appraisal risk assessment can compare the site's soil results with the HILs. This can then provide an *indication* of whether an immediate risk is likely. The consultant can then recommend that interim measures are implemented to prevent further exposure, until the final HRA report is completed.

- updated risk statements within the interim and/or final reports, following any further investigations that may be required
- characterise the risk by adopting a descriptive approach (using appropriate analogies), rather than quantifying risks with numbers.

## Summary

Where council plans to carry out soil assessment of a site they own or manage, it should:

- Choose a reputable environmental consultant with experience in land contamination.
- Specify the following within the contract conditions or tender specifications:
  - The site investigation will be carried out in accordance with the following: National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPM); AS 4482 Part 1 (2005) and Part 2 (1999); State Environment Protection Policy (SEPP) for Prevention and Management of Contamination of Land.
  - The reports will provide conclusions on the risk of possible harm, or detriment to beneficial uses of the land.
  - Where there are potential health risks, the reports will identify a range of options to manage them effectively.
  - If the initial findings of an investigation reveal contamination of concern, an interim report will be provided. This includes advice on interim measures to prevent further exposure, until the detailed assessment report and health risk assessment (HRA) is completed.
- Council's project leader should consult with other relevant areas of council—property management, planning, community services, environmental health, building and engineering, PR and communications. This allows the appropriate areas of council:
  - to be informed of what is happening
  - to assist with the overall process.

## For more advice:

- Environment Protection Authority (EPA) Land and Groundwater Unit, or the relevant EPA region—information on environmental site assessment reports, audits and remediation options, interpretation of technical information.
- Department of Human Services Environmental Health Unit—health risk communication and interpreting technical information.
- Where the site is occupied by a licensed children's service, contact the Regional Children's Services Adviser.

## Key websites

### **Victorian Department of Human Services**

[www.health.vic.gov.au/environment](http://www.health.vic.gov.au/environment)

[www.dhs.vic.gov.au/csguidelines](http://www.dhs.vic.gov.au/csguidelines)

### **Environment Protection Authority Victoria**

[www.epa.vic.gov.au](http://www.epa.vic.gov.au)

### **Australian Contaminated Land Consultants Association**

[www.aclca.asn.au](http://www.aclca.asn.au)

### **Environment Protection and Heritage Council**

[www.ephc.gov.au](http://www.ephc.gov.au)

### **Commonwealth Department of Health and Ageing**

[www.health.gov.au](http://www.health.gov.au)

### **enHealth**

<http://enhealth.nphp.gov.au/>

### **US Department of Health and Human Services**

#### ***Agency for Toxic Substances and Disease Registry (ATSDR)***

[www.atsdr.cdc.gov/HEC/primer.html](http://www.atsdr.cdc.gov/HEC/primer.html)

#### ***National Library of Medicine***

[www.nlm.nih.gov/pubs/cbm/health\\_risk\\_communication.pdf](http://www.nlm.nih.gov/pubs/cbm/health_risk_communication.pdf)

## Glossary of terms

<b>Beneficial uses</b>	Beneficial uses of land protected by the SEPP are: maintenance of natural and modified ecosystems; human health; buildings and structures; aesthetics; and production of food, flora and fibre.
<b>Characterised risk</b>	<p>This is the final step in the risk assessment process, integrating the information from the hazard and exposure assessments. It characterises the potential for adverse health effects to occur; the risk information is summarised and uncertainty is evaluated.</p> <p>It describes potential adverse health effects to individuals and populations in terms of their nature, extent and severity; communicates results of the risk assessment to the risk manager (US EPA, 1995, p. 4); and provides key information for risk communication.</p>
<b>Children’s service</b>	A service licensed under the <i>Children’s Services Act 1996</i> to provide care or education for five or more children under the age of six years in the absence of their parents or guardians: (a) for fee or reward; or (b) while the parents or guardians use services or facilities provided by the proprietor of the service. This includes child care centres, preschools, kindergartens and occasional care centres.
<b>Dose-response</b>	The relationship between the dose of a chemical and the extent of the toxic effect it produces in a biological system (NEPM SB4).
<b>Ecological investigation level (EIL)</b>	The concentration of a contaminant, above which further appropriate investigation and evaluation will be required (NEPM SB5).
<b>Exposure</b>	When a chemical, physical or biological agent makes contact with the outer boundary of an organism, such as by inhalation, ingestion or skin contact (NEPM SB4).
<b>Hazard</b>	An agent’s capacity to produce a particular type of adverse health or environmental effect. For example, one hazard associated with benzene is that it can cause leukaemia (enHealth, 2002)
<b>Health investigation level (HIL)</b>	Concentration of a contaminant, above which further appropriate investigation and evaluation will be required.
<b>Health risk assessment</b>	Estimating the potential impact of a chemical, biological, physical or social agent on a specified human population system, under a specific set of conditions and over a certain timeframe (NEPM SB4).
<b>Land contamination</b>	The condition of land where a chemical substance or waste has been added (at above background levels) and represents, or potentially represents, an adverse health or environmental impact (NEPM SB4).

<b>Potentially contaminated land</b>	<p>Land that is used, or known to have been used, for industry, mining or the storage of chemicals, gas and other wastes.</p> <p>Also, land that may have been contaminated by other means: ancillary activities, contamination from surrounding land, fill using contaminated soil or agricultural uses (based on DSE <i>General Practice Note, June 2005</i>).</p>
<b>Risk</b>	<p>The probability that, in a certain timeframe, an adverse outcome will occur in a person, group of people, plants, animals and/or the ecology of a specified area that is exposed to a particular dose or concentration of a hazardous agent. The risk also depends on the toxicity of the agent and the duration of exposure.</p>
<b>Risk assessment</b>	<p>Estimating the potential impact of a chemical, physical, microbiological or psychosocial hazard on a specified human population or ecological system, under a specific set of conditions and for a certain timeframe (enHealth, June 2002).</p> <p>Risk assessment may be a relatively quick ‘desktop’ study for simple issues (for example, a qualitative risk assessment), or a large and complex process where there are significant health concerns (for example, a detailed risk assessment that generates site specific ‘response levels’).</p>
<b>Risk management</b>	<p>Evaluating alternative actions, selecting options and implementing them in response to risk assessment. The decision making will incorporate scientific, technological, social, economic and political information. The process also requires value judgements, for example, on the tolerability and reasonableness of costs (enHealth, 2002).</p>
<b>Qualitative risk assessment</b>	<p>A risk assessment procedure that describes the risk with words. This can include categorising the risk as high, medium or low.</p>
<b>Quantitative risk assessment</b>	<p>A risk assessment procedure that uses numerical descriptions of the risk, for example ‘a one in one million chance’.</p>
<b>Sensitive uses</b>	<p>Land used for residential use, a child care centre, a pre-school centre, or primary school.<sup>16</sup></p>

16 As defined in Minister’s Direction No.1, amended from time to time under section 12(2)(a) of the Planning and Environment Act 1987 (adapted from the SEPP).

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## Appendix A

### Technical supplement

#### Site investigations

If a statutory environmental audit is not required under Part 14 of the *State Environment Protection Policy (SEPP) for Prevention and Management of Contamination of Land*, the consultant will usually begin the site assessment with a preliminary investigation.

Even if the site history and site inspection indicate no likelihood of contamination, initial sampling and analysis for a limited range of substances may be needed, to confirm the initial findings of the 'desktop' investigation. This also applies if the preliminary site investigation indicates the other extreme—a high likelihood of contamination.

Appendix 1 of NEPM Schedule B 2 contains a table of possible analytes (inorganic and organic contaminants) that may be sampled. Analyte selection is governed by site history. In addition, Table 2 from AS4482.1 2005 provides a list of possible (non-volatile) analytes for contaminated site assessment.

A satisfactory sampling plan will have an acceptable probability of detecting the presence of contaminants. This allows the consultant to provide suitable risk management options, as part of the assessment. AS4482.1-2005, sections 3 and 7, provide guidance on appropriate sampling densities. *Composite sampling is not acceptable*<sup>1</sup>.

Where sampling is conducted (either at the preliminary or detailed stage), the site map should indicate the number, depth and location of the samples taken and describe the surfaces of sampling locations. Corresponding analytical results of soil samples should be attached. A rationale for selecting the soil sample locations should be attached to the report.

The consultant should consider any on-site environmental impacts that are present but do not affect human health (such as adverse impacts on plants) and aesthetic effects other than odour (such as staining of surface soils). Suggested or required management options to deal with such impacts should be stated in the assessment report/s.

#### Preliminary investigations

Preliminary investigations should be performed according to Section 3 of AS4482.1 1997, and the general principles of the NEPM (particularly Schedule B2). Note that many of

these requirements will not be relevant to sites without a history of industrial, commercial or agricultural use.

In a preliminary investigation, health investigation levels (HILs) can be used as an indicator to confirm the likelihood of contamination. HILs therefore provide a trigger to assist in judging whether a detailed investigation of a site is necessary. A preliminary site-specific appraisal risk assessment can be undertaken by comparing site results with the appropriate HILs according to the site's current or proposed use.

At the end of the preliminary investigation, it may be concluded that:

- the soil at the site is unlikely to be contaminated and unlikely to pose a risk to human health
- or
- the soil at the site is contaminated or there is a likelihood of contamination—proceed to a more detailed site investigation and more sampling
- or
- guidance values are exceeded for some substances and there is enough information to devise a remediation/management strategy to control the potential health risk. This should be specified in an environmental management plan (EMP).

Before soil results are compared with HILs to make a health risk assessment, there should be sufficient characterisation of the site to ensure a meaningful and appropriate comparison. This then becomes a detailed site investigation.

#### Detailed investigations

A detailed investigation is required when the results of the preliminary investigation are insufficient for devising site management strategies. Whether there is *potential* or *actual* contamination will usually require further definition.

Professional judgement must be exercised in the design of any sampling program, consistent with NEPM Schedules B1, 2 and 3 and AS 4482.1. Sampling should reflect information obtained about the site's history and likely patterns of contamination.

Detailed site investigations should be carried out in accordance with Schedules 2, 3 and 7 of the NEPM and sections 4, 6 and 7 of AS 4482.1 2005

<sup>1</sup> Composite soil sampling combines a number of discrete samples into a single homogenised sample, for the purpose of analysis.

Soil sampling for the detailed site investigation report must be statistically adequate. More information on requirements for statistically adequate sampling is contained in AS 4482.1-2005, section 6 and appendices D–F.

At the end of the detailed investigation, the consultant may conclude that:

- the soil sample results did not exceed the relevant NEPM HIL criteria. This means the results for each substance identified (and for each stratum of soil tested) met the following relevant NEPM criteria (or other approved criteria where no NEPM criteria exist<sup>2</sup>):
  - The arithmetic mean of the level of each substance is below the relevant HIL, the standard deviation is less than half the relevant HIL, and no individual sample exceeds 2.5 times the relevant HIL.

and

- The investigation also indicates that there is no evidence of an unacceptable risk to human health, or the presence of an offensive odour associated with the site.

#### OR

If the soil sample results exceed the HIL criteria for nominated substances and/or there is evidence of an unacceptable health risk, the consultant may:

- devise a remediation/management strategy to control the health risk [these measures should be specified in an EMP]

or

- conduct a site-specific health risk assessment.

**In cases where HILs are exceeded by only minor amounts, or relate to contaminants with low human toxicity and limited mobility, a qualitative risk assessment may be sufficient. This may lead to the implementation of a site EMP to manage the risk.**

## Health risk assessments

If the HIL criteria are not met, the consultant may conduct a site-specific health risk assessment (HRA) to address relevant health concerns and determine whether further action is needed. This may range from informing residents or owners of the contaminated site, to large scale remediation.

A site-specific HRA should be conducted where results above HILs indicate a likelihood of adverse effects on human health for that site, or where there is a high degree of public interest and/or concern. An HRA may also be warranted if sample results (particularly at the soil's surface level, where there is potential for human exposure) are greater than 2.5 times the HIL.

Schedule B7A of the NEPM provides guidance about what type of results trigger a detailed site-specific risk assessment.

The level to which such assessments are conducted will depend on site-specific conditions. A detailed HRA can use specific exposure scenarios and factors to derive site specific criteria for identified chemicals of potential concern. The development of site specific criteria (or response levels) should be agreed to in consultation with the EPA and Department of Human Services and/or Auditors. Keep in mind that overt health effects would not be expected to occur until contamination is present at levels well in excess of response levels.

Any site-specific HRA should be conducted according to the NEPM Schedule B4 (Guideline on Health Risk Assessment Methodology). It may conclude that:

- the substances present are not at levels harmful to health
- and/or
- implementing the remediation/management measures specified in an EMP will control the potential health risk.

In many instances, site-specific HRAs will not be necessary. Problems will be 'obvious' and the significant resources required for an adequate site-specific risk assessment (such as the generation of site-specific soil criteria response levels), should be directed to site management.

<sup>2</sup> If no NEPM criteria have been derived for the contaminant/s on site, contact the EPA to discuss alternative criteria.

The site-specific HRA process is a multidisciplinary task, requiring considerable expertise: soil science, engineering, geology, history, chemistry, planning, statistics, occupational hygiene, occupational and public health medicine, environmental health, toxicology, health science and epidemiology. People involved in components of the HRA process should be qualified, experienced and have a broad understanding of health risk assessment/management and the practical realities of contaminated sites. While it is unlikely that one person will have the breadth of skills to undertake all components of the HRA, a single person must coordinate and take responsibility for the assessment.

### Risk assessment framework

Risk assessment estimates the potential adverse health effects of human exposures to environmental hazards (such as chemicals). All activities, processes and products have a degree of risk. The aim of a risk assessment is to provide risk managers (for example, councils) with complete information about the risks, so that the best possible decisions can be made.

Its primary aim is to protect public health and the environment, putting these responsibilities before all other considerations. Health risk assessment must be undertaken with an appreciation that the HRA is part of a larger assessment, encompassing ecological risk assessment.

Risk assessment may be a relatively quick 'desktop' study for simple issues (for example, a qualitative risk assessment), or a large and complex process where there are significant health concerns (for example, a detailed risk assessment that generates site specific 'response levels').

The process intends to achieve the following objectives, when assessing contaminated sites (USA EPA 1989):

- to establish baseline risks and whether site remediation or other action is necessary
- to determine a tolerable level of contaminants that can remain in place with adequate protection of public health
- to enable comparison of potential health impacts of various remediation techniques
- to provide a consistent method of appraising and recording public health risks at sites.

After an issue is identified, the risk assessment process involves hazard and exposure assessments. The risk can then be characterised.

### Hazard assessment

Hazard assessment comprises *hazard identification* and *dose-response assessment*. Both qualitative and quantitative toxicity information is used in assessing 'the incidence of adverse effects occurring in humans at different exposure levels' (US EPA, 1989, p. 1.6).

**Hazard identification** involves a (qualitative) description of an agent's (for example, chemicals) capacity to cause potential adverse health effects. It is based on an evaluation of epidemiological, clinical, toxicological and environmental research results. For example, "chemical X can cause severe stomach pain".

**Dose-response assessment** extrapolates the hazard identification results to predict the type and estimate the extent of health effects, under given conditions of exposure. It examines the quantitative relationships between exposure and the effects of concern. For example, "chemical X causes severe stomach pain if more than 5 milligrams is ingested"

### Exposure assessment

The **exposure assessment** determines the frequency, magnitude, extent, duration and character of exposures in the past, currently, and in the future (enHealth 2002). It includes analysis of hazard locations; identification of exposed populations; identification of potential exposure pathways (for example, inhalation, skin absorption, ingestion); estimation of exposure concentration for pathways; and estimation of contaminant intakes for pathways.

### Risk characterisation

The **characterised risk** is the final step in the risk assessment process, as it integrates the information from the hazard and exposure assessments. Once the potential for adverse health effects to occur is characterised, the risk information is summarised and uncertainty can be evaluated.

Risk characterisation describes the risks to individuals and populations in terms of nature, extent and severity of potential adverse health effects. It communicates the results of the risk assessment to the risk manager (US EPA, 1995, p. 4) and provides key information for risk communication.

Risk characterisation should include a summary of the key issues and conclusions of each component of the risk assessment, and describe the nature and likelihood of adverse health effects (enHealth 2002).

The following is a guiding principle (US EPA 1995, pg 2) when a risk assessment is conducted:

**Risk assessors (eg the consultant) and risk managers (for example, councils) should be sensitive to distinctions between risk assessment and risk management.**

In particular, the consultant should:

- generate a credible, objective, realistic, and scientifically balanced analysis
- present information on the separate components of the risk assessment
- explain the confidence in each assessment by clearly delineating strengths, uncertainties and assumptions, along with the impacts of these factors (for example, confidence limits, use of conservative/non-conservative assumptions) on the overall assessment. The risk assessors should do this without considering issues such as cost, feasibility, or how the scientific analysis might influence the regulatory or site-specific decision.

## Appendix B

### Council staff and risk communication

**Risk communication is not as simple as saying 'it will be OK'. It is a two-way discussion about risk and other concerns, focused on achieving the best solution. Public participation and acceptance will depend on the effectiveness of such council communications.**

This section presents risk communication concepts adapted from outside sources. (Developed from course notes, SA Centre for Public Health; and ATSDR Primer on Health Risk Communication). It covers:

- the myths surrounding risk communication and effective actions to deal with them
- identifying and avoiding typical pitfalls
- better listening skills
- appropriate and inappropriate risk comparisons.

#### An effective risk communication process

An effective risk communication process will improve dialogue and reduce tension between government and communities. It includes:

- understanding and appreciating people's perceptions of risk
- empathising with their emotions and concerns
- explaining health risk assessment information to the public
- involving the public in the risk management process.

The seven 'cardinal rules' (*US EPA*) for effective risk communication are:

- Accept and involve the public as a legitimate partner.
- Plan carefully and evaluate your efforts.
- Listen to the public's specific concerns.
- Be honest, open and frank.
- Coordinate and collaborate with other credible sources.
- Meet the needs of the media.
- Speak clearly and with compassion.

#### How communities perceive risk

**RISK = HAZARD + OUTRAGE** (*Sandman P, 1993*)

RISK	is the (quantitative) probability that a health effect will occur, after an individual is exposed to a specified 'amount' of a hazard.
HAZARD	is a source of danger, a (qualitative) term to describe the potential for an environmental agent to harm health.
OUTRAGE	is reduced when effective risk communication takes place and when the public's perception of the risk is not higher than the actual risk.

#### Interacting with the community

Community involvement leads to greater trust, understanding and a more appropriate reaction to the risk. It increases credibility and reduces outrage. It also recognises that people are entitled to make decisions about issues that directly affect their lives and encourages their input (*Chess et al. 1988*). Look to increase public participation when:

- controversy exists
- anxiety increases or feelings run high
- community input is needed
- people specifically ask to become involved.

#### Outrage factors

People's perception of risk is influenced by 'outrage factors'. The following list highlights factors that can contribute to either low and high risk perceptions. Consider this when comparing one risk to another. (*Sandman P, 1993*)

'lower' risk perceptions	'higher' risk perceptions
voluntary	involuntary
natural	man-made
not dreaded	dreaded
chronic	catastrophic
fair	unfair
certainty	uncertainty
children not at risk	children at risk
delayed effects	immediate effects
effects reversible	effects not reversible
little media attention	much media attention
trust	no trust
understood	not understood
not memorable	memorable

## Trust and credibility

Achieving trust and credibility requires the key qualities of COKE—**C**ommitment **O**penness **K**nowledge **E**mpathy. Trust and credibility may be lost by:

- not involving people in decisions that affect their lives
- holding on to information for too long
- ignoring people’s feelings
- not taking ownership and following up
- denial of mistakes
- presenting yourself in ‘bureaucrat speak’
- delays in talking with other relevant agencies
- doubting the public’s intelligence.

## Explaining risk

- Consider the outrage factors.
- Take care to give adequate background information when explaining test results.
- Explain risk completely and clearly.
- Collaborate with other agencies and stakeholders.
- Take care when comparing environmental health risks to other risks.
- Explain the cautious approach built into setting government standards and guidelines (for example, HILs).
- Ask whether you have made yourself clear—don’t assume that you have been fully understood.
- Recognise that communities determine what is acceptable to them.

## Risk communication: myths and actions

*(Adapted from: Chess et al. 1988)*

Belief in some common myths often interferes with development of an effective risk communication program. Consider these myths, together with the actions you can take to address them.

**Myth:** We don’t have enough time and resources for a risk communication program.

**Action:** Train all your staff to communicate more effectively. Plan projects to include public involvement.

**Myth:** Telling the public about a risk is more likely to unduly alarm people than keeping quiet.

**Action:** Decrease potential for alarm, by giving people a chance to express their concerns.

**Myth:** Communication is less important than education. If people knew the true risks, they would accept them.

**Action:** Pay as much attention to your process for dealing with people as you do to explaining the data.

**Myth:** We shouldn’t go to the public until we have solutions to environmental health problems.

**Action:** Release and discuss information about risk management options and involve communities in strategies in which they have a stake.

**Myth:** These issues are too complex for the public to understand.

**Action:** Separate public disagreement with your policies, from an incomplete understanding of the highly technical issues.

**Myth:** Technical decisions should be left in the hands of technical people.

**Action:** Provide the public with information. Listen to community concerns. Involve staff with diverse backgrounds in developing policy.

**Myth:** Risk communication is not my job.

**Action:** As a public servant, you have a responsibility to the public. Learn to integrate communication into your job and help others do the same.

**Myth:** If we give them an inch, they’ll take a mile.

**Action:** If you listen to people when they are asking for inches, they are less likely to demand miles! Avoid the battleground by involving people early and often.

**Myth:** If we listen to the public, we will devote scarce resources to issues that are not a great threat to public health.

**Action:** Listen early to avoid controversy and the potential for disproportionate attention to lesser issues.

**Myth:** Activist groups are responsible for stirring up unwarranted concerns.

**Action:** Activists help to focus public anger. Most groups are reasonable and responsible—work with groups, rather than against them.

## Avoiding the pitfalls of risk communication

(Adapted from: ATSDR Primer on health risk communication principles and practices)

### • Pitfall: Jargon

**Do** define all technical terms and acronyms.

**Don't** use language that may not be understood by even a portion of your audience.

### • Pitfall: Humor

**Do** use it to relieve tension, but direct it entirely at yourself.

**Don't** use it in relation to safety, health or environmental issues.

### • Pitfall: Negative allegations

**Do** refute the allegation, without repeating it.

**Don't** repeat or refer to them.

### • Pitfall: Negative words and phrases

**Do** use positive or neutral terms.

**Don't** refer to national problems, such as: 'This is not Love Canal'.

### • Pitfall: Reliance on words

**Do** use visuals to emphasise key points.

**Don't** rely entirely on words.

### • Pitfall: Temper

**Do** remain calm. Use a question or allegation as a springboard to say something positive.

**Don't** let your feelings interfere with your ability to communicate positively.

### • Pitfall: Clarity

**Do** ask whether you have made yourself clear.

**Don't** assume you have been understood.

### • Pitfall: Abstractions

**Do** use examples, stories and analogies to establish a common understanding.

**Don't** use inappropriate analogies.

### • Pitfall: Non-verbal messages

**Do** be sensitive to non-verbal messages you are communicating. Make them consistent with what you are saying.

**Don't** allow your body language, position in the room, or attire to be inconsistent with your message.

### • Pitfall: Attacks

**Do** attack the issue.

**Don't** attack the person or organisation.

### • Pitfall: Promises

**Do** promise only what you can deliver. Set and follow strict orders.

**Don't** make promises you can't keep, or fail to follow up.

### • Pitfall: Guarantees

**Do** emphasise achievements made and describe ongoing efforts.

**Don't** say "there are no guarantees".

### • Pitfall: Speculation

**Do** provide information on what is being done.

**Don't** speculate about worst case scenarios.

### • Pitfall: Money

**Do** refer to the importance you attach to health, safety and environmental issues; emphasise that your moral obligation to public health outweighs financial considerations.

**Don't** refer to the amount of money spent as a representation of your concern.

### • Pitfall: Organisational identity

**Do** use personal pronouns ('I', 'we').

**Don't** take on the identity of a large organisation.

### • Pitfall: Blame

**Do** take responsibility for your share of the problem.

**Don't** try to shift blame or responsibility to others.

- **Pitfall: ‘Off the record’**

**Do** assume everything you say and do is part of the public record.

**Don’t** make side comments or ‘confidential’ remarks.

- **Pitfall: Risk/benefit/cost comparisons**

**Do** discuss risks and benefits in separate communications.

**Don’t** discuss your costs along while describing risk levels.

- **Pitfall: Risk comparison**

**Do** use them to help put risks in perspective.

**Don’t** compare unrelated risks.

- **Pitfall: Health risk numbers**

**Do** stress that true risk is between zero and the worst-case estimate. Base your actions on federal and state standards, rather than risk numbers.

**Don’t** state absolutes, or expect the public to understand risk numbers.

- **Pitfall: Numbers**

**Do** emphasise performance, trends and achievements.

**Don’t** mention or repeat large negative numbers.

- **Pitfall: Technical details and debates**

**Do** focus your remarks on empathy, competence, honesty and dedication.

**Don’t** provide too much detail, or take part in protracted technical debates.

- **Pitfall: Length of presentations**

**Do** limit presentations to 15 minutes.

**Don’t** ramble, or fail to plan the time well.

## Some dos and don’ts of listening

*(Adapted from: Atwater 1989)*

### Do:

- become aware of your own listening habits
- share responsibility for the communication
- concentrate on what the speaker is saying
- listen for the total meaning, including feelings
- observe the speaker’s non-verbal signals
- adopt an accepting attitude
- express empathic understanding
- listen to yourself
- ‘close the loop’ of listening, by taking appropriate action.

### Don’t:

- mistake not talking for listening
- ‘fake’ listening
- interrupt needlessly
- pass judgment too quickly
- make arguing an ‘ego-trip’; don’t argue
- ever tell a speaker: ‘I know exactly how you feel’
- overreact to emotive language
- give advice, unless it is requested
- use listening as a way of hiding yourself.



## Using risk comparisons

*(Adapted from: Covello et al. 1988; Covello 1989)*

In explaining risk data, you may wish to compare a risk number to another number.

### Remember:

- comparisons can help put risk in perspective
- benefits should not be used to justify risks
- irrelevant or misleading comparisons can harm trust and credibility.

### Guidelines for risk comparisons

When making risk comparisons:

- **First-rank (most acceptable) comparison:**
  - of the same risk at two different times
  - with a standard
  - with different estimates of the same risk.
- **Second-rank (less desirable) comparison:**
  - of the risk of doing something, versus not doing it
  - of alternative solutions to the same problem
  - with the same risk experienced in other places.
- **Third-rank (even less desirable) comparison:**
  - of average risk with peak risk at a particular time or location
  - of the risk from one course of an adverse effect with the risk from all sources of the same effect,

- **Fourth-rank (barely acceptable) comparison:**

- with cost; or one cost/risk ratio with another
- of risk with benefit
- of occupational risk with environmental risk
- with other risks from the same source
- with other specific causes of the same disease, illness, or injury.

- **Fifth-rank (rarely acceptable—use with extreme caution!) comparison:**

- of unrelated risks (for example, smoking, driving a car, lightning).

Remember the ‘outrage factors’ that people use in their perception of risk. The more a comparison disregards these factors, the more ineffective the comparison!

## Appendix C

# Soil investigation levels and health investigation levels— community fact sheet

### What are soil investigation levels?

Soil investigation levels are guidance values that provide some basic information about potential health risks associated with sites where no other information is known. They are not intended as a trigger for response or cleanup activities, nor are they accepted standards. Rather, they signal that further investigation is needed.

There are two types of soil investigation levels. **Health investigation levels** (HILs) relate to human health, and **ecological investigation levels** (EILs) relate to the environment. Investigation levels are designed to assess the average level of a substance across a site. A site may still meet the investigation level criteria, even if there are a couple of levels above the nominated value, if the rest of the site has lower levels. Therefore, levels of substances slightly above HILs or EILs are not necessarily unacceptable.

Investigation levels are based on many assumptions about the people exposed and the types of exposure situations. In many cases, the specific circumstances at that site may mean that soil concentrations above the investigation level are acceptable.

When investigation levels reveal that further investigation is required, this can include:

- taking more samples to check the spread of substances across the site, or their depth under the soil (for example, whether they are at or below the soil surface)
- investigating whether the substances/s move in the soil.

In many cases, once additional investigations are conducted, there is little risk indicated to people's health.

### What are the investigation levels for child care and education settings?

The level used in a kindergarten or child care setting is the same as for a standard low-density residential setting with garden areas, where residents [adults and children] have access to soil.

These investigation levels are generally quite cautious and are set to take into account a 'worst-case' scenario, which could be described as a situation where:

- the substance is at the surface<sup>1</sup> and is in a form that is readily absorbed into the body (100 per cent bio-available)
- and
- the most sensitive people are exposed (for example young children)
- and
- they are also exposed to the same chemicals through many other sources, such as in their diet and in the drinking water.

### When is there a risk to health?

Whether substances in soil pose a health risk or not depends on whether people are exposed. This depends on many factors relevant to that site and to the people who use that site (children and/or adults). For example:

- Do the people have access to the soil?
- What is the age of the people? (Young children are usually more vulnerable than adults).
- How often do the people come in contact with the soil, and for how long?
- Are the substances in a form that is easily absorbed by the body (after a person eats or inhales the soil, or after the soil comes into contact with skin)?

<sup>1</sup> The term 'surface soil' generally refers to the top 10 cm of soil.

## Appendix D

### Sample fact sheets for parents

#### Parent Information Sheet #1

#### Council's land assessment survey—Kiddy Street Kindergarten

##### Why is our kinder's soil being tested?

Council is responsible for addressing all potential risks to public health on council owned land. As a licensee of a children's service, council must ensure that every reasonable precaution is taken to protect the children at Kiddy Street from any hazards. A soil assessment will be done to ensure that the children are not exposed to any soil contamination that may affect their health.

##### Council's proposed action plan

The City of Kidtown's contaminated land policy has identified council owned sites that need assessment. This includes the eight children's services (kindergarten, occasional care centres and child care centres) in the municipality, including Kiddy Street Kindergarten.

Council has engaged a professional environmental consultant to conduct these surveys. Next week, the consultant will begin the preliminary assessment of Kiddy Street Kindergarten. Some soil samples will be taken from the play areas to test for the presence and levels of various substances.

##### When will the soil assessment for Kiddy Street Kindergarten be completed?

When the environmental consultant finishes the preliminary assessment, further investigation may or may not be required. This all depends on the soil sampling results. The preliminary assessment should be completed by the end of the month.

More soil samples will be taken if further investigation is needed. We will keep you informed if this is the case.

##### Who can I contact to discuss this further?

If you have any queries or concerns about this process, or would like to make any suggestions about what is proposed, please contact the City of Kidtown's communication's coordinator on xxxx xxxx.

If you would like to view council's contaminated land policy, please call the above number, come in personally, or download the policy from the following website: <http://www.cityofkidtown.vic.gov.au/contlandpolicy.pdf>

## Parent Information Sheet #2

### Preliminary soil assessment at Kiddy Street Kindergarten

#### What has happened?

Council has engaged an environmental consultant to conduct a preliminary soil assessment at Kiddy Street Kindergarten. This involved some soil samples being taken from the play areas, to test for the presence and levels of various substances. The environmental consultant has now completed the first stage of the investigation.

#### What did the preliminary assessment show?

The preliminary assessment has shown that further investigation of the soil is required to determine whether replacement of some soils will be needed.

Some lead was found in the soil, but it is deep below the soil's surface. The levels found so far are typical of those found in any inner urban backyard.

#### Is there a health risk?

There is not enough information at this stage to confirm that the soil contains unacceptable levels of substances. However, from the information received to date, a risk to children's health is not likely.

A potential health risk only exists if people are directly exposed to soil contaminants. The contamination found is 30 centimetres under the soil's surface; children will not be able to dig down to this depth. Also, as most of our play areas are covered with adequate barriers, such as lawn, tanbark, and rubber surfacing, exposure to contaminated soil is unlikely. Further samples of soil will be analysed, however, as part of a more detailed assessment.

#### When will the soil assessment be completed?

Further testing of soil will be followed by a detailed assessment report, including a health risk assessment. This process is expected to be complete within two months.

#### Whom can I contact to discuss this further?

If you have any queries about the preliminary assessment, or what is involved in the detailed investigation, please contact the City of Kidtown's communication's coordinator on xxxx xxxx. If you did not receive a copy of the last information sheet (*Council's land assessment survey—Kiddy Street Kindergarten*), contact council on this same number.

## Parent Information Sheet #3

### Soil testing at Kiddy Street Kindergarten

#### What are health investigation levels?

Health investigation levels are guideline values that can help with assessing potential health risks. They provide a trigger that further investigation is required, in order to satisfy the suitability of the site for the given use. The health investigation levels for children's services are very cautious, in order to protect children.

In many cases, the health risk is found to be low once additional investigations are conducted.

#### What did the soil analysis at Kiddy Street Kindergarten show?

The detailed soil analysis performed for the City of Kidtown has shown that:

- levels of all tested substances (including lead) did not exceed the national Health Investigation Levels (HILs) for soil, with the exception of the level of polycyclic aromatic hydrocarbons (commonly known as PAHs), which was found to be above the HIL.

It is not uncommon to find elevated levels of PAHs in residential settings.

#### What are PAHs and where are they found?

PAHs are a group of products that occur if natural compounds such as coal, oil, petrol and wood are incompletely burnt.

PAHs are commonly found in air, food, water and soil. In the home environment, low levels of PAHs can be found in smoke and ash from burning or burnt materials. For example, PAHs are present in:

- foods that have been cooked or barbequed on an open fire, chargrilled, smoked/cured or accidentally burnt (for example, burnt toast)
- ash, coal or charcoal that has been buried in the garden after cleaning out barbeques, fireplaces, wood heaters, backyard incinerators
- landscaping fill that was brought on site in older, inner city areas of Melbourne
- old lubricant oil wastes from car engines
- smoke from wood fires or cigarettes.

#### How can you be exposed to PAHs?

PAHs are present throughout the environment and you may be exposed at home, outside or in the workplace. People are exposed to PAHs everyday when they breathe in air that contains these substances (for example, cigarette or wood smoke, exhaust from cars, fires), or eat food that has been cooked, smoked or chargrilled on an open fire. Children can also be exposed if they eat or touch soil that contains PAHs. This is more likely with children in the toddler age group (0–2 years).

#### How can PAHs affect my health?

Animal studies have shown that PAHs can cause harmful effects on the skin and affect the body's ability to fight disease after both short and long term exposure. **However, these effects have not been seen in humans.**

Some PAHs, such as benzo(a)pyrene have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ate them in food (stomach cancer), or had them applied directly to their skin (skin cancer). These studies were based on the animal's exposure being at very high doses and over an extended period of time.

The likelihood of PAHs causing cancers in humans is less clear. Some workers who handled or breathed in PAHs and a range of other chemicals over a long time developed cancer. In some cases, cancer has been linked to the other chemicals, not the PAHs. Apart from an association between breathing in PAHs and other chemicals from cigarette smoke and the development of lung cancer, evidence of specific PAHs causing other types of cancers in humans is not available.

### What is the significance of elevated levels of PAHs in soil at Kiddy Street?

Whether substances in soil pose a health risk depends on whether people are exposed to them. This depends on many factors, such as how accessible the soil is to people, the age of people, how often people come in contact with the soil, and for how long, and whether the substances are in a form that is easily taken into the body.

**The consultant's Health Risk Assessment report highlights that the PAH contamination at this site would not have caused a health risk to children who attended the site.** This is because of the following circumstances:

- In order for the PAH contaminants to pose a risk to children, there must be direct contact with their skin or their mouths. The consultant report indicates that most of the soil in the main play areas was protected by lawn, tanbark or concrete paving. This therefore reduces opportunities for any significant direct contact with the soil.
- The skin's ability to absorb this type of PAH is minimal.
- Attendance of children at this centre is for only 4–12 daytime hours (if appropriate) a week and includes both indoor and outdoor activities.
- The children are three to four years old and are less likely to eat soil than toddlers.

The risk from exposure to PAHs at Kiddy Street would be less than the daily risk from exposure to PAHs from other sources encountered in normal living.

### Why replace the soil?

Cleaning up the site to levels below the HILs would mean that the site can be accessed by children without risk of exposure to a particular contaminant, regardless of the site condition or the amount or type of access offered. Replacing the soil also reduces the need for ongoing environmental management of the site. Clean-up works will be conducted this weekend.

### Should I test or monitor my child because of this?

No. While a blood test for PAHs exists, the medical significance of results is not known.

### Who can I contact to discuss this further?

Contact City of Kidtown on xxxx xxxx for any queries relating to the clean-up or the consultant's report. Contact the Environment Protection Authority on xxxx xxxx concerning the extent of contamination, and the Environmental Health Section of Council on xxxx xxxx, or the Department of Human Services on 1300 761 874, for any health concerns you may have.



