



Land Contamination & Environmental Specialists

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‘What You Need To Know About Contaminated Land...’

An Overview for Property Investors, Developers and Project Managers.

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As Principal Environmental Geologist and Director of Atma Environmental, Glenn has over 28 years direct experience in environmental consulting in Australia and overseas ranging from potable water well installations to underground storage tank cleanups to environmental screening of large corporate land portfolios. Glenn has overseen the operations and management of hundreds of contaminated land assessment, remediation, and other projects since inception of the company in Australia 1996.



1 INTRODUCTION

The most important thing to understand about contaminated land is this:

The main reason people investigate land contamination issues is because of the legal liability associated with it - because *land ownership changes transfer environmental liabilities to the new owner.*

This means it's possible to unwittingly purchase an expensive hidden environmental liability along with the land title, particularly where the remediation expenses to develop the land are not fully understood. *Just one mistake in this area is enough to literally bankrupt an investor or developer.*

As such, from a risk management perspective, it is prudent to get a qualified Environmental Specialist to report on the potential contamination status of land prior to purchase, and if necessary, formulate and carry out contaminant management or site remediation plans.

There are, of course, many other reasons as well for undertaking contaminated land investigations, including: an application to rezone land use, compliance issues, remediation cost estimates, ascertaining offsite environmental impacts, categorization of soils prior to disposal, or contractual requirements for you to demonstrate the condition of the land.

Contamination issues may already exist or may arise later (for instance if the owner wants to use a property for a use that the land is not currently suitable for, e.g. development of residential or office facilities on a former industrial site).

1.1 Statutory and Civil Liabilities

In the main, contaminated land liability issues generally fall into two categories: *statutory and civil liabilities.*

Statutory Liabilities are generally referred to as 'compliance issues' which means specific state or federal legislation requires certain action on behalf of the land owner or land user.

Civil Liabilities exist where a member of the community experiences some form of loss, damage or injury due to the contamination on the site. This puts the land owner in a position where they may potential be responsibility for payment of damages or other court-enforcement orders should a lawsuit arise.

1.2 Environmental Consulting and Control of Site Development Costs

It is important to understand that an environmental consultant plays an extremely important role in controlling the costs associated with site development, especially if they are used early in the site development process.

A contaminated land assessment is best performed before any construction work or demolition begins because this allows for a fuller investigation to identify and characterize contaminated areas and eliminates the real problem of construction delays while the required assessments are made and/or any conflicts between the requirements of the site investigation vs. site construction. Also, demolition or construction can cause contamination of otherwise clean areas on the site, and therefore cause increases in site remediation costs.

Unforeseen contamination issues that arise during construction or demolition are expensive because they cause construction delays including down time, holding charges and unused site facilities, as well as potential OH&S issues - with all their associate statutory and civil liabilities. All this can lead to significant cost blow outs.

By providing timely identification of contamination issues, remediation options and prudent advice on how to best navigate the minefield of regulatory and environmental issues/requirements associated with site development, a contaminated land specialist is an important key in managing development costs.

This report, "What you need to know about contaminated land..." is an overview of what the main considerations are, and how they may affect your position. In it we cover:

- purchaser and vendor positions,
- land contamination audits,
- site clean-up,
- Environmental Site Investigations,
- information on pertinent regulations with respect to contaminated land issues, and
- other valuable information such as local Council requirements.

More specific inquiries, beyond the scope of this document, can be directed to Atma Environmental Pty Ltd at no charge. We will provide expert assistance with any contaminated land issues. Readers are encouraged to seek additional advice beyond the scope of this document to protect themselves from incurring unwanted liabilities due to contaminated land or to get advice on dealing with known or suspected land contamination.

2 PURCHASER'S ISSUES

An environmental site investigation (assessment) or 'audit' is most commonly sought by a land purchaser before taking over security on industrial, commercial, or other potentially contaminated land, and sometimes even residential land where a risk of contamination is evident.

Before the sale of land, a purchaser must be aware of the possibility that the land they are considering buying may be contaminated.

To avoid any liabilities or the consequences of a clean up notice after sale, the purchaser should make the following preparations and inquiries before entering into a contract:

If the vendor claims that the site is clean, then the purchaser should obtain a warranty clearly stating this. The warranty should extend until after the sale of the property.

If the vendor discloses to the purchaser that the site has been contaminated in some way or form, then it is the purchasers' responsibility to decipher the cost of remediating the site before sale, and adequately factor this cost into the sale price. To obtain a reasonable estimate an experienced environmental consultant such as Atma Environmental should be retained, who are highly experienced with such matters.

Also note that in most circumstances obtaining a warranty from a purchaser is not practical. Legally the onus falls upon the purchaser to satisfy themselves as to the condition of the land prior to settlement. As a result, the purchaser may wish to carry out their own (or more in-depth) studies of the property using an environmental consultant to undertake an independent environmental site investigation.

In Australia and elsewhere, the first and most common stage of assessment is a Preliminary Site Investigation (PSI), or Phase 1 environmental site assessment. On the basis of this initial exploratory assessment further assessments may be conducted (if warranted). Specific information on the stages of site investigation follows. A general discussion on environmental site investigations is included in section 7 of this document.

2.1 Preliminary Site Investigation (PSI) or Phase 1

Determining the risk of site contamination is the first stage and is frequently referred to as a Phase 1 report, or a Preliminary Site Investigation (PSI). The PSI should include a full review of the current site setting, the site history information and relevant information on surrounding properties to assess the potential of a site to be contaminated. Included in this is an inspection of the site and surrounding areas.

Generally, the site investigation process as detailed in Australian Standard (AS) 4482 "*Guide to the investigation and sampling of sites with potentially contaminated soil*" is followed. However, sometimes these requirements are reduced due to the scope of a particular project.

A Preliminary Site Investigation (PSI) usually involves the following:

- identification and description of the site, and a review of the site's physical setting (geology, hydrogeology, topography, etc);
- a records review of zoning status, historical aerial photos, building permits, land titles, and inquiries about the site's past history and development;
- a reassessment of any related environmental reports or audits;
- a site reconnaissance visit to verify desktop review information and to visually inspect the site (and surrounds) for contamination; and

- often, limited contaminant sampling and analysis is also undertaken at areas of potential environmental concern.

The PSI may conclude that there is a significant potential for contamination (in which case further studies should be conducted). It is also important to realise that even if there is no direct evidence of contamination from the records review and site visit, contamination may still be present due to the past use of polluted fill material, or incomplete records; and as such, limited (preliminary) contaminant sampling and analysis is prudent and desirable.

Even if the PSI finds no overt evidence that the site is contaminated the purchaser may still argue for a reduction in the sale price due to the risk of finding contamination after settlement, if there is a likelihood that this may be the case (i.e. a potential for contamination is identified).

2.2 Detailed Site Investigation (DSI) or Phase 2

If the PSI identifies a risk of contamination then a Detailed Site Investigation, or DSI, is conducted. The DSI is the site sampling, or Phase 2 investigation stage. It sets out to investigate the risk of site contamination - usually with the site's proposed land use in mind; or to inform upon appropriate site management strategies. Soil is always tested and groundwater and/or surface water is tested where the past use has a risk of contributing to it's contamination; the soil is contaminated with compounds that can contaminate groundwater; or, if a surrounding site is known to be or is potentially contaminated and this has a risk of migrating to the site.

The site is generally investigated in accordance with the requirements found in AS4482. Again, these may be reduced due to the scope of a particular project. When the soil is being tested with a particular land use in mind, the concentrations of soil chemicals are compared to the National Environment Protection Council's "*National Environmental Protection (Assessment of Site Contamination) Measure (NEPM)*".

If the soil is being tested with removal offsite in mind then the concentrations of soil chemicals need to be assessed against the requirements stated in Environmental Protection Authority (EPA) Publication IWRG621 "*Soil Hazard Categorisation and Management*".

If the DSI has been undertaken to the Australian Standard and demonstrates that the site is not contaminated, then no further works are likely required. If it demonstrates that the site is contaminated, then further investigation to delineate the extent of contamination or to enable professional advice about potential human health risks, may be required (see below).

Obtaining advice from a highly qualified company such as Atma Environmental on any Preliminary Site Investigations, Detailed Site Investigations or environmental site assessment (ESA) reports that have been provided to you as a potential purchaser will identify any inherent limitations and areas of uncertainty in the reports and will alert you to contamination risks that may not be spelt out in the report. Often, it is the *absence of information* that poses the biggest buyer's risk!

2.3 Further / Other Investigations

As evidence the site is 'clean', or is satisfactory, the vendor may provide reports determining the "extent of contamination", and subsequent site remediation, validation testing and/or reporting concerned with cleaning up a site to a level suitable for its proposed use.

If you are a purchaser and have been provided with this type of report, it is advisable to have it independently reviewed to ensure any previously identified contamination has been adequately assessed and that the site has been remediated for the proposed site use. The term "clean" can be used relative to a land use that is different to the land use you intend.

If the site has *not* been adequately assessed in the first instance and some form of remediation then documented, there may *still* be areas of undisclosed contamination present!

3 VENDOR'S ISSUES

Following are the three most common questions asked by vendors with regard to the sale of land that has potential contamination issues:

Legal Disclaimer: *The answer to these questions is a legal matter and such a definitive answer is beyond the scope of this document, so anyone reading should seek their own legal advice, however we provide an opinion here, for the purposes of education. We stress that this is not legal advice and we encourage the reader to seek their own legal advice on the following issues.*

3.1 'How much and what type of information needs to be disclosed to the purchaser so I'm not held liable?'

One answer to this could be 'caveat emptor' or the 'buyer beware'. This implies the vendor has no duty to disclose the state or existence of site contamination on the property, and therefore the vendor may choose to disclose nothing. However, if a Statement of Environmental Audit has been issued for the property, this must be disclosed.

If the vendor does choose this course of action, *they run the risk of being held liable for misrepresentation if there was known contamination on the site, or if their action resulted in the contamination of the site.*

If there is known contamination at the site we might suggest that the vendor should either:

1. Disclose all known contamination on the site resulting in the purchaser accepting liability for it; or
2. Allow an environmental investigation to be performed by the purchaser.

Full disclosure of all information relating to the sites contamination status will remove the potential for being held liable for misrepresentation.

3.2 'Am I liable for unknown site contamination after the sale?'

As long as you have provided full disclosure to the purchaser and your contract is structured so that upon sale of the property all liability will be passed to the purchaser, then most likely you will not be held liable for any unforeseen contamination.

3.3 'Am I obliged to allow the purchaser access to the site, before sale to carry out an environmental investigation?'

The answer to this is the vendor is not obliged to allow the purchaser access to the site as long as it's not trying to conceal information that should have been disclosed earlier.

Vendors may wish to engage an environmental specialist to perform an assessment of the property to demonstrate the site condition prior to putting it on the market. Often this will satisfy prospective purchasers and eliminate the need for site access by multiple third parties. It must be remembered that a reputable environmental specialist will clearly state the limitations of any assessment work.

3.4 Other Vendor Considerations

There are some sites that prospective purchasers will rightly be wary of unless there is sufficient environmental assessment on the table. In particular are former service station sites, or other sites that present a high risk of groundwater contamination.

In these instances the vendor may simply need to make an investment in assessment of the land in order to attract a buyer.

In our experience, the most commercial outcome for the vendor can be achieved by completion and disclosure of an environmental investigation demonstrating the sites contamination status to potential purchasers. This removes the 'unknown' liability concerns for the purchaser (which can result in them deducting an amount from the offer price) and allows both parties to agree on the best and fairest price for the site.

4 LOCAL COUNCILS AND CONTAMINATED LAND

Land developers need to be aware that local councils have a significant interest in contaminated land and its use. Potentially contaminated land is defined in *Ministerial Direction No. 1 – Potentially Contaminated Land 1989*, as land used or known to have been used for industry, mining or the storage of chemicals, gas, wastes or liquid fuel (if not ancillary to another use of land).

The planning system is the primary means for regulating land use and approving development and is an important mechanism for triggering the consideration of potentially contaminated land. *The Planning and Environment Act 1987* requires a planning authority when preparing a planning scheme or planning scheme amendment to 'take into account any significant effects which it considers the scheme or amendment might have on the environment or which it considers the environment might have on any use or development envisaged in the scheme or amendment' (Section 12).

Ministerial Direction No. 1 – Potentially Contaminated Land (Direction No. 1) requires planning authorities (e.g. Councils) when preparing planning scheme amendments, to satisfy themselves that the environmental conditions of land proposed to be used for a sensitive use (defined as residential, child-care centre, pre-school centre or primary school), 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.

Most Councils have determined certain areas that may be 'potentially contaminated' and have identified these properties with a planning overlay known as an *Environmental Audit Overlay*, where development applications trigger a contaminated land audit. A PSI should ascertain if the land is affected by an Environmental Audit Overlay.

Clause 15.06 of the State Planning Policy Framework contains State Planning Policy for soil contamination. *Clause 15.06-2* refers to Direction No. 1 and also states that in considering applications for use of land used or known to have been used for industry, mining or the storage of chemicals, gas, wastes or liquid fuel, responsible authorities should require applicants to provide adequate information on the potential for contamination to have adverse effects on the future land use, for example: a Preliminary Site Investigation, or Phase 1 ESA report.

The Environmental Audit Overlay (EAO) is a mechanism provided in the Victoria Planning Provisions and planning schemes to ensure the requirement for an environmental audit under Direction No.1 is met before the commencement of the sensitive use or any buildings and works associated with that use. The application of the overlay, in appropriate circumstances, ensures the requirement will be met in the future but does not prevent the assessment and approval of a planning scheme amendment.

The Act also requires a responsible authority, before deciding on a planning permit application, to consider 'any significant effects which the responsible authority considers the use or development may have on the environment or which the responsible authority considers the environment may have on the use or development' (Section 60).

The level of environmental assessment required by a Council in assessing a development application will depend on the past site use and its potential for contamination, as well as the proposed type of land use.

Published guidance for Councils to make that determination looks like the table below.

It is important to remember that even though a site may *not* have an Environmental Audit Overlay (EAO), a planning authority still needs to satisfy itself as to the suitability of the land for a new approved usage. This means that Councils (in assessing development applications) require a *de minimus* level of environmental information (as per 'C' in above table) and it is their prerogative to require an environmental audit be completed (irrespective of the lack of an EAO) where the risk of contamination is judged to be high.

PROPOSED LAND USE:	POTENTIAL FOR CONTAMINATION:		
	High	Medium	Low
Sensitive Uses -			
<i>Child care centre, pre-school or primary school</i>	A	B	C
<i>Dwellings, residential buildings, etc.</i>	A	B	C
Other Uses -			
<i>Open Spaces</i>	B	C	C
<i>Agricultural</i>	B	C	C
<i>Retail or office</i>	B	C	C
<i>Industrial or warehouse</i>	B	C	C
Site Assessment Requirements:			
A – An <u>environmental audit</u> is strongly recommended where the planning permit application would allow a sensitive use.			
B – Requires a <u>site assessment</u> from a suitably qualified environmental professional.			
C – General duty under Section 12(2)(b) & Section 60(1)(a)(iii) of the Planning & Environment Act 1987.			

From the foregoing discussion one may now understand the desirability of a land developer having a comprehensive PSI completed - as this determines the contamination risk, and the contamination risk influences the extent of contamination assessment that is potentially imposed as part of the planning process.

A comprehensive PSI is of additional value to the developer because it will (done correctly) also provide an early indication of any Prescribed Industrial Waste (Contaminated Soil) that needs to be managed during construction.

5 ENVIRONMENTAL AUDITS

The term 'audit' has no single definition in the environmental field. It can be applied to a quick inspection of an industrial operation, or it can mean certification of a remediated site.

Under the *Environment Protection Act 1970 (Part IXD)* two types of environmental audits are provided for:

1. For the condition of a segment of the environment (e.g. land contamination audits specifically for property), or a '53X' Audit; and
2. Regarding the risk of any possible harm to a segment of the environment caused by any industrial process or activity, etc. (e.g. risk of landfill gas to a development site), or a '53V' Audit.

In Victoria, Contaminated Land Auditors are appointed by the EPA. Their function is to ensure that audited land meets the specifications for a desired end use. Consequently, they must be independent of the environmental consultant engaged to assess and/or clean up the property.

Audits may be required if the property is to be rezoned to a more 'sensitive' land use (e.g. commercial to residential), or a request has been made to remove it from the Contaminated Sites Register (an official list of badly polluted sites), or it has specific audit requirements under an EPA Victoria notice. An non-statutory audit may also be requested where the above does not apply (e.g. for contractual purposes).

The auditor must prepare a separate report based on the site assessment/clean-up work and evaluate contamination in the light of 'any beneficial uses' that may be made of the site and in accordance with EPA Guidelines. This may involve an assessment of the site by others than the assessor, such as a human health risk specialist. The EPA must be informed when the Auditor is appointed and of the results of their audit once completed. In addition, a scaled fee (based on the square area of the site) is payable to the EPA upon notifying them that an audit has been requested. EPA Victoria publishes completed audit reports, which can be searched by the public at <http://www.epa.vic.gov.au/our-work/environmental-auditing/53v-reports-certificates-statements-of-environmental-audit>

Where the Auditor finds that the site is suitable for 'any beneficial use' he may issue a Certificate of Environmental Audit and the site can be used for whatever purpose. Currently, these are more the exception.

Where an Auditor finds that the site contains some residual contamination she may issue a Statement of Environmental Audit. A Statement will often list restrictions on the property such as acceptable land uses and maintenance of physical barriers against contamination exposure.

Development of such land can proceed if the levels of site contamination are acceptable and in keeping with the proposed land use, or there is an acceptable health risk to future site users. Complete and total clean-up of contamination is not always required.

Before a Statement or Certificate of Environmental Audit may be completed, the environmental assessment and remediation works (if required) must be completed and documented by the site assessor. Typically, preparation of the Audit will require at least four weeks following completion of the assessment report.

Audits may be terminated prior to completion, however, the appointed auditor needs to provide to the EPA the reason for terminating the audit. EPA generally seeks further information on the contamination status of sites where an audit is terminated.

Information explaining the audit system and protocols can be found in the following EPA Victoria documents:

- *Environmental Auditor (Contaminated Land), Guidelines for Issue of Certificates and Statements of Environmental Audit* - EPA Publication 759.2 (7 Feb 2014).
- *Environmental Auditing of Contaminated Land* - EPA Publication 860.1 (3 October 2007).
- Information explaining the audit system can be found in *Environmental Auditor Guidelines for Conducting Environmental Audits*, EPA Publication 953.2 (3 October 2007).
- *Environmental Auditor Guidelines – Provision of Environmental Audit Reports Certificates & Statements* - EPA Publication 1147.1 (18 Jan 2013).

- *Environmental Auditor Guidelines – Preparation of Environmental Audit Reports on Risk to the Environment* – EPA Publication 952.4 (16 April 2013).

6 ENVIRONMENTAL SITE ASSESSMENTS AND SITE REMEDIATION

Sections 2.1 to 2.3 provided an overview of the generic stages or phases of environmental site assessment which might be considered by a purchaser (but which are equally applicable to vendors). Each successive phase of assessment is intended to build on the information gathered during the previous phase.

In practice, however, the precise scope of work carried out may vary.

6.1 Determining the Right Scope for Environmental Investigation Work

In the Introduction we said “the reason people investigate land contamination issues is because of the legal liability associated with it - because *land ownership changes transfer environmental liabilities to the new owner*”.

It is true that much of the work is driven by property transactions, but that is not the only reason for conducting an environmental site assessment:

- You may already own the land and are seeking to rezone it (audit required?);
- You may need to demonstrate the condition of the land for other reasons such as:
 - Sale of the land (divestment);
 - A lease agreement contract exit clause;
 - Dept of Education & Early Childhood Services childcare facility approval;
 - A baseline assessment (e.g. prior to a lease or refinancing);
 - Land portfolio (i.e. risk) management;
 - A planning application;
- Compliance issues (e.g. service stations, landfills);
- Disposal of soils from a bulk excavation;
- Provision of remediation cost estimates;
- Ascertaining if off-site environmental impacts exist or not.

In retaining the services of an environmental specialist it is crucial to have the objectives for the work defined. In this way the parameters of the site assessment can be defined with reference to Data Quality Objectives (DQO's). Essentially, these are criteria that: a) define the study objectives, b) define appropriate types of data to collect, and c) specify the tolerable levels of potential decision making errors. These will ensure the environmental site assessment is focused on collecting the information needed to make decisions, and answering the relevant questions leading up to such decisions.

It is essential for recipients of environmental assessment services to recognize that any assessment, even those conducted in strict accordance with recognized standards - have limitations. Your consultant should inform himself of your needs and report on the methodology and limitations of the investigation.

In some circumstances a properly executed Preliminary Site Investigation (PSI) without sampling, or Phase 1 report, may suffice. More frequently, there is at least some potential for site contamination – often due to an ancillary use (e.g. a mechanical shed on a farm), in which some initial sampling at a number of locations based on professional judgment will be desirable to confirm that or to demonstrate it is absent.

A Detailed Site Investigation (DSI) is required when the results of the PSI indicate that contamination is present or is likely to be present and the information available is insufficient to enable site management strategies to be developed. The number and type of samples to be obtained and tested will be driven by the DQOs. A Sampling and Analysis Quality Plan (SAQP) is then developed to confirm the types of contaminants present on the site and/or to determine the source and the extent of contamination both laterally and vertically to a specifiable degree. Where the DSI is at variance to guidelines such as AS4482, reasons should be provided (e.g. number of sampling locations less than minimum recommended).

In plain English – you can take a few samples, or you can take a lot of samples, but more samples means a higher degree of certainty as to the occurrence and extent of site contamination. This is of particular import when making decisions involving removal of soil for disposal or planning a development.

In a practical sense one might choose to escalate investigations as in this example:

'Initial anecdotal information indicates there are some past spills on a site' –

1. Conduct a PSI with limited targeted soil sampling of the spill area.
2. Sensitive groundwater & impact confirmed by the PSI --> install groundwater monitoring wells near former spill (hydro-geological investigation).
3. Limited groundwater liability confirmed by the hydro-geological investigation -> complete a DSI to national standard.
4. DSI identifies soil hotspots requiring clean up -> prepare a Remedial Action Plan.
5. Remediate contamination and validate the site as clean -> sale transaction can now occur.

'Preliminary' investigations may involve the collection of just a few random or targeted samples to 'screen' the site. In all cases the preliminary assessment should include at least a records review, historical check and a site reconnaissance visit to determine the potential for contamination to exist on the land.

There are Australian Standards for site investigation which clients should be aware of, particularly AS4482. Where a site is undergoing an official Audit, these standards need to be adhered to.

Frequently referred to information from AS4482 is the table for: *Minimum Sampling Points Required for Site Characterisation Based on Detection of Circular Hot Spots Using Square Grid*. This information may be useful for Project Managers comparing requesting, or comparing environmental site assessment proposals:

Area of the site, hectares: (1 ha = 10,000 m ²)	Minimum number of sampling of points recommended:	Diameter of the hotspot that can be detected with 95% confidence, meters:
0.05	5	11.8
0.1	6	15.2
0.2	7	19.9
0.3	9	21.5
0.4	11	22.5
0.5	13	23.1
0.6	15	23.6
0.7	17	23.9
0.8	19	24.2
0.9	20	25.0
1.0	21	25.7
1.5	25	28.9
2.0	30	30.5
2.5	35	31.5
3.0	40	32.4
4.0	50	33.4
5.0	55	35.6

The appendix provides additional background on the standards and guidelines used in contaminated land practice.

6.2 Site Remediation

Remediation may need to be performed on the site to reduce or eliminate contamination in identified areas and to make the site suitable for a specific use. A Remedial Action Plan (RAP) is prepared and will usually include the following:

- a description of the current site status (i.e. the site investigation report);
- the choice of remediation method(s);
- application for and receipt of necessary permits;
- appropriate provisions for occupational health and safety of personnel;
- implementation of the remediation; and
- production of a technically sound report that is suitable for the purposes of the Contaminated Land Auditor.

In general, for small amounts of contamination, the most popular and fastest method for clean-up is excavation and removal of soil to a licensed facility such as a landfill.

Other methods such as bioremediation and thermal destruction are available but may take longer to implement. Certain economies of scale will apply when selecting the best remediation method. In addition, the suitability of the clean up method must be matched to the type of contamination.

Often in this process, soil needs to be transported offsite to a landfill facility to remove the contamination. When sampling is conducted for this purpose EPA Publication IWRG702 'Soil Sampling' needs to be followed, with the soil chemical concentrations are assessed against

the requirements stated in EPA Publication IWRG 621 '*Soil Hazard Categorisation and Management*'.

6.3 Environmental Management Plans (EMPs)

Following a sufficient and appropriate level of site sampling it may be determined that contamination at a site may be best managed in-situ rather than remediated.

An Environmental Management Plan may be prepared to identify for site users the type and location of contamination and restrictions on the use of the site. Such restrictions may include maintaining contamination barriers, not accessing contaminated groundwater, or not using the site for more sensitive land uses than are assessed as acceptable, etc.

Generally, Environmental Management Plans will indicate conditions that must be adhered to, or tasks that must be undertaken, for example: the maintenance of hard surfacing which precludes occupant exposure to contaminants.

Although Environmental Management Plans may provide a way to manage contamination (vs. remediating it) they represent an enduring liability and are something vendors would need to disclose to future purchasers.

Environmental Management Plans or Groundwater Quality Management Plans may arise as the result of a concluded 53X audit.

7 COSTS

Professional fees and costs for the investigation and remediation of contaminated land or potentially contaminated land will vary depending on the objectives of the assessment as well as the size, condition and nature of the site.

If the site is large but has few possible areas of contamination, investigation and remediation cost will be lower than for a large site with many areas of possible contamination. In general, the higher the potential human health risk, the more expensive the investigation and remediation will be.

This document outlined earlier how environmental site investigations are generally undertaken in a staged approach with each subsequent stage building on the results of the proceeding stage. Contaminated land practitioners are investigators and frequently this means that the course of the investigation (thus, the ultimate scope of work) is dictated by facts as they arise. Consequently, the provision of a fixed fee or lump sum cost is generally only possible where the scope of work entails a PSI, or a tightly specified DSI.

Environmental consultants will frequently provide professional services according to a Schedule of Rates where the objectives of the brief demand a specific outcome. The alternative is to have multiple lump sum variations to address new findings throughout the entire process – leading to delays in final delivery. Regardless, your contaminated land professional should be

able to inform you as to the process and likely costs and keep you apprised of any developments necessitating additional costs as they come to light.

It is important to note that it is far preferable to have contamination assessments performed **before** any work (construction or demolition) is done on a site, because the assessment may find that the contamination is isolated to certain areas, in which case these areas can be remediated before they become a worker health and safety issue, or cause un-necessary construction delays while the problem is assessed and a solution worked out. **Construction delays due to unforeseen contamination issues are expensive and include holding changes, down time, unused site facilities, builder variations, etc.** Furthermore, if these areas are disturbed, there is a risk of the contamination being spread to otherwise clean areas on site, and this can significantly increase the overall site remediation costs.

From the above discussion one can surmise that environmental consultants often play an important role in *controlling* the costs related to site development by providing timely identification of issues and giving of prudent advice required to navigate what is sometimes a minefield of regulatory issues and environmental requirements.

It should also be evident that the initial investigation often requires additional work where contamination is identified on the site. The reasons for this are that remediation efforts require more detailed information that is not necessarily collected during a preliminary investigation, such as determining acceptability at the landfill.

Finally, the costs for assessing groundwater issues are considerable. Sites posing a high risk of contamination (such as service stations) will most often require an assessment of groundwater contamination. On smaller projects this component may double the assessment costs. Groundwater assessment costs may frequently escalate where contamination is detected due to the fact that groundwater is not static and numerous rounds of sampling are required to establish reliable trends in the contamination readings.

8 GROUNDWATER

Groundwater is water that saturates soil pore spaces and rock fractures beneath the surface. It may lie many meters below the surface or just below the surface. Where it exists closer to the surface it is at greater risk of contamination.

Where groundwater may be used for drinking or other purposes (i.e. where it is of suitable quality) this resource has to be protected. Assessment and remediation of ground water is generally an expensive proposition due to the fact that it is difficult to access directly and may only flow slowly making it difficult to remove contaminants.

For these reasons sites that have contaminated groundwater may pose a much greater financial liability than other sites having only soil contamination. Land managers and persons considering purchase of high contamination risk sites need to especially bear in mind the risk of groundwater contamination.

Hydrogeological assessment is a systematic study of geology, hydrogeology, geochemistry and contamination at a site. Many activities can cause groundwater contamination. Contaminant sources can be sudden releases from spills or accidents, gradual releases from long-term leaks, or industrial and agricultural practices since the 1800s. An understanding of how contamination sources may impact the groundwater system is required.

Contaminants with low solubility can be present as a separate phase in the aquifer representing an uncontrolled source of contamination and must be removed unless the EPA is satisfied that there is no unacceptable risk posed. Should this be revealed in the course of an environmental audit, the auditor is required to notify the EPA of the separate phase contamination. Where groundwater contamination is identified or suspected (either dissolved or as a separate phase), there should be a qualitative or quantitative risk assessment to evaluate the significance of the contamination and the risk to beneficial uses.

In Victoria there is a *State Environmental Protection Policy (SEPP) Groundwaters of Victoria*. The SEPP divides the groundwater environment into Segments based on salinity with protected Beneficial Uses (such as potable drinking water, irrigation use, etc) assigned for each segment of the groundwater environment. These Beneficial Uses are in turn assessed by comparison of various quality criteria for those uses against groundwater chemical analysis results.

Groundwater CUTEF (Clean Up to the Extent Practicable). In the event that groundwater is polluted (the water quality is not suitable for its protected beneficial uses), EPA require it to be cleaned up. If it is impracticable to clean up groundwater to a level needed to restore its beneficial uses EPA may accept that 'clean up to the extent practicable' has occurred. EPA's acceptance of this outcome is on the basis of a formal CUTEF submission by an Auditor which describes the condition of the groundwater and the precluded beneficial uses, and also evaluates the technical, logistical and financial feasibility of the available clean up options, and appropriate measures to manage residual contamination. A CUTEF submission is only required where pollution is due to contamination sourced from the site or where the beneficial use is considered to be existing or likely.

The guideline which provides details on EPA's requirements and expectations for developing and implementing the clean up and management of polluted groundwater to ensure the protection of human health and the environment is:

- *The Cleanup and Management of Polluted Groundwater* – EPA Publication 840.1 (7 Feb 2014)

Groundwater Modelling. In cases where groundwater contamination may be unacceptable, it may be necessary to undertake computer modeling simulations to assess the risk of unacceptable impact on the environment and human health. This involves the application of models to simulate the spread, dispersion or decay of plumes of contaminants in space and time.

Additional technical information on groundwater assessment may be found in:

- *Hydrogeological Assessment (Groundwater Quality) Guidelines* - EPA Publication 668 (Sept 2006).

9 ASSISTANCE WITH CONTAMINATED LAND

Assistance with contaminated land may be had by contacting Atma Environmental at the address shown on the front of this bulletin.

Atma Environmental will meet with property buyers, owners, developers and others to discuss their concerns and options available to them. Readers are encouraged to seek additional advice beyond the scope of this document to protect themselves from incurring unwanted liabilities due to contaminated land or to get advice on dealing with known land contamination.



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APPENDIX: PRIMARY GUIDELINES USED IN THE CONTAMINATED LAND ASSESSMENT PROCESS IN VICTORIA

The following is a run down on only the most frequently referenced guidelines used in general contaminated land practice. In practice, there are many guidelines used that are not listed here. Some of these are mentioned in the foregoing report.

Readers should also note this list does not include relevant State legislation and policy.

Australian Standard AS4482 *“Guide to the investigation and sampling of sites with potentially contaminated soil”* (2005) is used widely in the contamination assessment process. It provides guidance for collecting sufficient and reliable information for the assessment of a site potentially contaminated with non-volatile, semi-volatile and volatile compounds. It includes guidance on the site investigation process, sampling design and data quality objectives. Contaminated land practitioners will refer to this guideline in determining the minimum recommended number of sampling locations for a given size of site.

National Environment Protection Council (NEPC), *‘National Environment Protection (Assessment of Site Contamination) Amendment Measure (No. 1)’*, 2013 provides comprehensive guidance in relation to site assessment processes and includes criteria for ecological and human health-based investigation levels in soil and groundwater. The purpose of this document is *“to establish a nationally consistent approach to the assessment of site contamination to ensure sound environmental management practices by the community which includes regulators, site assessors, environmental auditors, landowners, developers and industry”*.

Contaminated land practitioners will refer to this guideline for, among other things, the comparative criteria applicable for various chemicals, to assess various land uses. Within this document are also guidelines on data collection, sampling design, reporting, and laboratory analysis, plus risk assessments.

EPA Victoria Publication IWRG621 *“Soil Hazard Categorisation and Management”* (2009) outlines the management requirements for different wastes taken off-site for reuse, disposal or treatment. IWRG621 stipulates the concentrations of soil chemicals used to classify Prescribed Industrial Waste (contaminated soils) into one of three disposal categories (A, B or C). The maximum allowable concentrations of soil chemicals for material to be used as ‘fill’ material are also outlined in this document.

EPA Victoria Publication IWRG702 *“Soil Sampling”* (2009) provides “guidance on classifying and reusing fill material for offsite reuse” and “the pattern and number of samples to be taken to enable appropriate classification for soils being moved off-site”. Contaminated land professionals will have reference to this document in determining the number of samples to obtain and test before classifying soil for disposal.

The **Victoria Department of Sustainability and Environment** *“General Practice Note - Potentially Contaminated Land”* (2005) is a document used by planners and applicants to help identify if land is at risk of being contaminated due to past uses and the appropriate level of environmental assessment required based on the ascertained risk and proposed land use. It identifies a list of medium and high contamination risk land uses.

EPA Victoria Publication 888.2 “Guidelines on the Design, Installation and Management Requirements for Underground Petroleum Storage Systems (UPSSs)” (1 July 2013) is a guideline with the purpose of being a key reference for owners and operators of UPSS on design, installation and management aspects of both new and existing UPSS, to ensure the protection of people property and the environment. It also addresses gaps in other guidance in relation to leak prevention, detection and cleanup. Specifically, Publication 888.2 requires the removal of tanks no longer in service and associated any contamination to the extent practicable.