Atma Environmental

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'WHAT YOU NEED TO KNOW ABOUT CONTAMINATED LAND ..."
An Overview for Property Investors, Developers and Project Managers

Date: July 2019

MEMBER: Australian Contaminated Land Consultants Association

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Contents

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Glenn has continuous and direct contaminated land experience since 1985 within Australia and overseas. His experience ranges from special government projects to environmental screening of large corporate land portfolios to complex site investigations. As Principal Environmental Consultant and Director of Atma Environmental, he has overseen the operations and management of thousands of contaminated land assessment, remediation, and other projects since establishing Atma Environmental in 1996.

1 INTRODUCTION

One of the most important things for property investors, developers and managers to understand about contaminated land is this: land contamination issues require attention because of the liabilities associated with it, that is, ***land ownership changes can 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, to determine the *actual* contamination status using an appropriate level of site investigation and sampling.

There are, of course, many other reasons as well for undertaking contaminated land investigations, including: an application to rezone or subdivide the land, a regulatory Notice, to determine remediation costs, management of known contamination hotspots, ascertaining if offsite environmental impacts exist, for categorizing soils prior to disposal, for various contractual reasons (such as leases), or for demonstrating a duty of care.

Contamination issues may already exist, or *may only become relevant (or apparent) later* when the land usage changes (for instance purchasing a commercial site that has future residential development 'potential').

1.1 What is Contaminated Land?

Contaminated land is a consequence of past practices including waste disposal, emissions, or other activities that have increased the levels of metals, hydrocarbons and other chemicals in the environment above levels that might occur naturally (if at all). Although mainly due to industrial practices, contamination may arise due to commercial, agricultural and domestic activities.

Property contamination may affect soil, surface water, or groundwater. In some cases, contamination may also affect the air which is breathed. The severity (or concentration) of contamination is crucial to understanding if ecological or human health impacts may be present. More severe contamination (i.e. above reference investigation levels for potential ecological or human health impacts) is sometimes distinguished from 'contamination' as 'pollution'.

A solid understanding of the contamination source(s), exposure pathways and contaminant receptors is required to fully assess contaminated land. Contaminated land may pose risks ranging between nominal and significant, based on a myriad of site-specific details.

1.2 Legal Considerations for Contaminated Land (Victoria)

Readers should be aware that this document is prepared from the perspective of businesses operating in Victoria, Australia and that the terminology and advice given may not be applicable to other locations or jurisdictions.

LEGAL NOTICE
The contents of this publication, current at the date of publication, are for reference purposes only. They do not constitute legal advice and should not be relied upon as such. Specific legal advice about your specific circumstances should always be sought separately before taking any action based on this publication.

The *Environment Protection Amendment Act 2018* (Vic) is to replace the existing *Environment Protection Act 1970* (Vic). The new Act focuses on prevention of environmental harm and introduces a range of significant new powers, duties and compliance mechanisms. The Act provides for a complete overhaul of the environmental regulatory framework in Victoria that shall take effect in July 2020.

Regarding contaminated land there are some key features in the Act including:

- General Environmental Duty (i.e. requiring the risk of harm to human health or the environment from pollution or waste to be identified and steps taken to ***minimize risks/impacts*** as far as reasonably practicable, similar as under Victorian WHS legislation)
- Pollution Incidents (that is, a new ***duty to notify*** of pollution incidents as soon as practicable, and a ***duty to restore*** areas affected by a pollution incident).
- Contaminated Land (including requirements to ***manage*** contaminated land that is to identify, investigate and implement measures in response to contamination, and a ***duty to notify*** the EPA of contamination - including historic contamination).

The new Act also formalizes the rights of third parties to apply for civil orders restraining breaches of an environmental duty and toughens penalties and the requirements for related entities and company officers, while further giving the EPA new compliance and enforcement powers.

Vendors of contaminated sites in Victoria are not prohibited from contracting out of all historical or future environmental and contamination liability like in some other Australian jurisdictions. It is therefore critical for purchasers and lessees of potentially contaminated land, such as service stations and industrial sites, to undertake thorough due diligence, ensure adequate disclosure and negotiate effective warranties and indemnities to reduce their potential liability.

Under the new *Environment Protection Amendment Act 2018,* EPA may serve an Action Notice to any of the following:

- the person who the Authority or authorised officer reasonably believes ***caused or permitted*** the circumstances which are the subject of the notice (including past land owners);
- the ***current owner or occupier*** of the land at which the relevant circumstances exist;

- the owner or occupier of the land at which the relevant circumstances exist, ***at the time*** the relevant circumstances first came into being.

Moreover, the Bill allows that a person in management or control of land may recover in a court of competent jurisdiction, as a debt due to the person, any reasonable costs incurred in complying with an environmental action notice, including any reasonable costs incurred by the person in taking action under this section, against ***any person responsible*** for causing or contributing to contamination of the land.

The new legislation has significant implications for property investors, developers and project managers especially where they are the owners of contaminated land, or potentially contaminated land.

1.3 Why Engage an Environmental Consultant?

Aside from the pre-purchase due diligence and statutory planning requirements (which we cover later) 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 to altogether avoid, or to 'cost-in' contamination liabilities. An example would be where you engage your consultant to complete a pre-purchase assessment and discover before you purchase the site that there is a significant plume of groundwater contamination which would need to be cleaned up.

A contaminated land assessment is best performed before detailed project planning commences to identify any significant site development constraints.

If left until the commencement of construction or demolition, a fuller investigation to identify and characterize contaminated areas can result in construction delays (costs) and/or conflicts between the requirements of the site investigation vs. site construction while the required assessments are made. An example would be where the planning requirements have not necessitated a detailed report, but then issues (such as asbestos in soil) are discovered by the builder.

Unforeseen contamination issues that arise during construction or demolition are expensive because they cause delays including down time, holding charges and unused site facilities, as well as potential OH&S issues. All of which can lead to a loss of control on the part of the developer and 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 partner in managing development costs. For example, assisting the owner of large portfolio of inner-city sites to identify the source of pollution and to focus resources and quarantine the undesirable implications for other sites they own.

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 considerations
- sites with a high potential for contamination
- the role of Councils in managing contaminated land
- types of environmental site assessments and how they are scoped
- land contamination audits
- site remediation planning, and
- costing of environmental services

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 issues due to contaminated / potentially contaminated land and give you advice on how to best deal with known or suspected land contamination.

1.4 When is an Environmental Site Assessment Required?

An environmental site assessment may be required for number of reasons:

- to inform the sale or purchase of a property
- as part of a planning permit application to subdivide or redevelop land for residential purposes
- as part of a planning permit application to have a new use of land approved
- in support of a statutory environmental audit that is being conducted for the property
- in response to an EPA Notice
- to establish 'baseline' site contamination conditions with respect to a new or expiring property lease
- to assess the land for licensing purposes (e.g. child care or EPA)
- where the owner is exercising their 'duty of care' and seeks to establish and/or control their liability in relation to site contamination (e.g. feasibility, legal, General Environmental Duty)
- for peace of mind
- to characterize soil for offsite disposal

1.5 When is Site Decontamination Required?

Currently in Victoria, site decontamination (i.e. remediation) is driven by the *State Environment Protection Policy (Prevention and Management of Contamination of Land) 2013 amendment,* aka the 'SEPP – Land'; and by the *State Environment Protection Policy (Waters) 2018,* aka the 'SEPP – Waters'.

The SEPP – Land requires all Victorians to prevent contamination; and where appropriate and practical, ***to clean-up, or otherwise manage*** pollution to protect the various beneficial uses of land. Essentially then, clean-up of pollution is required whenever the beneficial uses of land protected under this Policy (maintenance of ecosystems, human health, aesthetics, etc.) are being precluded by contamination.

Similarly, the SEPP - Waters clarifies obligations and provides measures to protect and maintain the environmental quality of Victoria's various water environments. Specifically, contamination must not cause a risk to the protected beneficial uses of waters. The clean-up of non-aqueous phase liquids (e.g. petrol layers) is explicitly required under section 54 of the SEPP.

Therefore, if site contamination poses a risk and it cannot be effectively managed, then it needs to be cleaned-up.

2 TYPES OF ENVIRONMENTAL REPORTS

Familiarity with the various types of environmental reports prepared by the contaminated land consulting industry is useful in becoming an instant expert and understanding what you may require. Because reports can be termed differently, the main types of contaminated land reports are explained below:

Type of Report:	**Meaning:**
Preliminary Site Investigation (PSI) *(aka Phase 1 Environmental Site Assessment)* *(aka Preliminary Site Assessment)* *(aka Preliminary Environmental Assessment, PEA)*	Means an initial stage of desktop assessment to collect basic physical and historical information to ascertain potential areas/sources of contamination and to develop an understanding of possible contaminant impacts. It sometimes includes limited sampling.
Detailed Site Investigation (DSI) *(aka Phase 2 ESA)* *(aka Environmental Site Assessment)* *(aka Comprehensive Site Assessment, CEA)*	Means those investigations required to identify the nature of and the lateral/vertical extent of soil and/or groundwater contamination to a sufficient degree where the risk can be assessed, or a remediation plan made.
Limited or Targeted Site Investigation *(aka … Assessment)*	A site investigation which may, or may not include a site history, but which is intended to provide an initial appraisal of site contamination conditions by testing the area(s) most likely to be polluted.
Environmental Audit (Contaminated Land) report	Within Victoria, this is the outcome of a statutory process in accordance with provisions under section 208 of the *Environment Protection Amendment Act 2018.* The audit report states which segments of the environment are suitable for what use.

Environmental Management Plan *(aka Site Contamination Management Plan)*	In the context of contaminated land management, a plan which identifies the site contamination hazards, responsible parties, and the requirements or procedures which need to be followed under various circumstances in order to manage risks to human health the environment.
Hydrogeological Assessment	A report (typically for planning purposes) that is prepared to inform Councils about potential groundwater issues which may influence the subdivision and construction of new estates, or buildings with deep basements.
Risk Assessment Report	Further to detailed site assessment it may necessary to complete a numerical evaluation of ecological or human health risks to estimate the hazard posed and/or to recommend risk-based site remediation levels.
Soil Disposal Hazard Categorisation Report	This is a report prepared in accordance with the EPA Vic Industrial Waste Resource Guidelines indicating the soil disposal hazard classification for offsite disposal of contaminated soil at landfill. Sometimes confused with a 'clean fill certificate' (only applicable to uncontaminated soil).

3 BUYING AND SELLING POTENTIALLY CONTAMINATED LAND

3.1 Purchaser's Issues

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

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

Obtaining advice from a highly qualified company such as Atma Environmental on any preliminary site investigation, detailed site investigation, or other type of environmental site assessment reports that has 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!

To help avoid unforeseen liabilities or the consequences of a clean-up notice after sale, the purchaser

should make the following inquiries before entering into a contract:

- *What are the past uses of the land?*
- *Are there are any past activities (on or near the land) that could have resulted in contamination of all or part of the land?*
- *Have sufficiently robust investigations been carried out to determine the above?*
- *What is the likelihood that the land will be contaminated and/or what are the magnitude of the potential contamination liabilities?*

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 determine 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, who are highly experienced with such matters, should be retained.

In general, the onus falls upon the purchaser to satisfy themselves as to the condition of the land prior to settlement. Purchasers may therefore wish to carry out their own investigation. If a report has been provided by the vendor, they should to have that report independently reviewed by a qualified contaminated land consultant.

Completing such a review is vital to avoiding buying a catastrophe. It may also just determine that a more in-depth study of the property is required to ensure that is not the case.

Screening of sites does not need to be costly. Based on our years of experience in contaminated land, Atma Environmental can provide an extraordinary value proposition to prospective land purchasers.

3.2 Vendors Issues

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

'How much and what type of information needs to be disclosed to the purchaser?'

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 prior actions 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 and have the purchaser accept liability for it; or
2. Allow an environmental investigation to be performed by the purchaser.

Full disclosure of all information relating to a site's contamination status will remove the potential for being held liable for misrepresentation.

'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. However, should a prospective purchaser believe there to be contamination present (and is unable to test that), you should expect offers that account for the associated uncertainty and the 'uncertainty discount' may be greater than an informed estimate, leading to lower offers.

To eliminate the need for site access by multiple third parties and to demonstrate the site condition prior to putting it on the market, vendors may wish to satisfy prospective purchasers by engaging their own contaminated land consultant for an assessment. It must be remembered that a reputable environmental specialist will understand their duty of care to both the client and to prospective buyers, and should clearly state the limitations of any assessment work.

'Why should I invest in an expensive assessment on something I'm just going to sell?'

There are some sites that prospective purchasers will rightly be very wary of unless there is a sufficient, appropriate and recent environmental site assessment report on the table. To attract a buyer in these instances, the vendor may need to invest in a suitably structured site contamination assessment.

In particular this includes former service station sites and other sites that present a high risk of groundwater contamination, such as dry cleaners, metal platers, etc.

In our experience, the most commercial outcome for the vendor can be achieved by completion and disclosure of an environmental investigation demonstrating the site's 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 ***highest and fairest sale price*** for the site.

3.3 Sites with a High Potential for Contamination

Land owners and managers of land now have environmental duties under the *Environment Protection Amendment Act 2018* requiring them to be informed and to take reasonable steps to prevent contamination and to manage risks.

Guidance as to which types of sites (i.e. past land uses) pose the highest potential for land contamination has been published to assist responsible authorities assess planning permit applications and determine the appropriate level of site assessment that is required (more on this

later). The below list is drawn from the "*General Practice Note - Potentially Contaminated Land"* (Department of Sustainability and Environment Victoria, June 2005).

Sites with a 'high' potential for contamination include land used for:

- Abattoir
- Abrasive blasting
- Airport
- Asbestos production/disposal
- Asphalt manufacturing
- Automotive repair/servicing
- Battery manufacturing/recycling
- Bitumen manufacturing
- Boat building/maintenance
- Breweries/distilleries
- Brickworks
- Chemical manufacture's/storage/blending
- Cement manufacture
- Ceramic works
- Coke works
- Compost manufacturing
- Concrete batching
- Council works depot
- Defence works
- Drum re-conditioning facility
- Dry cleaning
- Electrical/electrical components manufac.
- 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
- Sewerage treatment plant
- Ship building/breaking yards
- Shipping facilities – bulk
- Stock dipping sites
- Spray painting
- Tannery (and associated trades)
- Textile operations
- Timber preservation/treatment
- Tyre manufacturing
- Underground storage tanks
- Utility depots
- Waste treatment/incineration/disposal
- Wool scouring

Notwithstanding the above list, sites with uses other than those listed above can also have significant contamination (for example: a farming property, where inappropriate demolition has resulted in widespread asbestos contamination). Atma Environmental can assist owners with single properties, or large land portfolios establish their contaminated land risk profile.

4 RESPONSIBLE AUTHORITIES 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. *Ministerial Direction No. 19* (released on 10 October 2018) requires planning authorities to seek advice from the EPA Victoria when preparing planning scheme amendments that may result in significant environment, amenity and human health impacts due to pollution and waste (such as which may allow the use or development of potentially contaminated land).

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 the use of 'potentially contaminated land' responsible authorities should require applicants to provide adequate information on the potential for contamination to have adverse effects on the future land use ('adequate information' meaning a preliminary site investigation report at a minimum).

If the land is potentially contaminated and a rezoning will allow for a sensitive use, Direction No. 1 provides that a planning authority must satisfy itself that the land is suitable through an environmental audit. Alternatively, an *Environmental Audit Overlay (EAO)* may be applied on the property to defer this requirement until such time as an application for a sensitive use is lodged.

A preliminary site investigation should identify if the land is affected by an Environmental Audit Overlay.

The environmental audit overlay 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 *Planning and Environment 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). Some responsible authorities will also require an environmental site assessment for planning

applications involving a change in use (vs. a change in zoning). For example: a warehouse changing to a food factory.

The level of environmental assessment required by a Council in assessing and approving 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 below 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 -			
Child care centre, pre-school or primary school	**A**	**B**	**C**
Dwellings, residential buildings, etc.	**A**	**B**	**C**
Other Uses -			
Open Spaces	**B**	**C**	**C**
Agricultural	**B**	**C**	**C**
Retail or office	**B**	**C**	**C**
Industrial or warehouse	**B**	**C**	**C**
Site Assessment Requirements:			
A – An environmental audit is strongly recommended where the planning permit application would allow a sensitive use.			
B – Requires a site assessment 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, whether or not an environmental audit is required; and because the contamination risk influences the extent of further contamination assessment or remediation that is potentially imposed as part of the planning process.

A comprehensive preliminary site investigation 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.

Why is it Important to Identify if an Environmental Audit May be Required?

Simply said, the costs of completing a statutory environmental audit are far greater than for completing an environmental site assessment; and in many cases, potentially contaminated land is not identified by virtue of an existing environmental audit overlay. It is therefore important

to engage with an experienced consultant who is able to forecast these issues, especially when you are making purchase decisions.

5 TYPES OF ENVIRONMENTAL SITE ASSESSMENT

5.1 Preliminary Site Investigation (PSI) or Phase 1

Determining the risk of site contamination (e.g. answering the question '*is it potentially contaminated land*'?) is the first stage of assessment. It is frequently referred to as a Phase 1 report, or a preliminary site investigation (PSI) or assessment report.

The PSI should include a review of the current site setting, the site history information and of environmental records to assess the potential for a site to be contaminated. Included in this is an inspection of the site and surrounding areas. The PSI should identify the potential contaminants, relevant exposure pathways and receptors of interest.

Generally, site investigation processes as detailed in Australian Standard (AS) 4482 "*Guide to the investigation and sampling of sites with potentially contaminated soil*" and in *Schedule B2 Guideline on Site Characterisation* of the National Environmental Protection Council, *National Environmental Protection (Assessment of Site Contamination) Amendment Measure.* 2013 (NEPM) are followed.

A preliminary site investigation generally 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 re-assessment of any previous environmental reports or audits
- a site reconnaissance visit to verify desktop review information and to visually inspect the site (and surrounds) for contamination
- sometimes, limited contaminant sampling and analysis is also undertaken at areas of potential environmental concern
- a conceptual site model outlining contamination potential contaminant source-pathway-receptor linkages
- recommendations for further assessment (if potentially contaminated)

The PSI may conclude that there is a 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 may be 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).

Assuming there is sufficient information and the PSI concludes that the site is not potentially contaminated, then further assessment would not normally be recommended. In these circumstances a properly executed PSI (without sampling) should suffice.

Frequently however, 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 case some initial targeted sampling at locations based on professional judgment will be desirable to confirm the contamination, or to demonstrate that contamination is absent.

In all cases the preliminary assessment should include at least a records review, a historical check and a site reconnaissance visit to determine the potential for contamination to exist on the land. If there is insufficient information available to make a confident determination on the potential for site contamination, then some site sampling should be considered at the PSI stage.

5.2 Detailed Site Investigation (DSI) or Phase 2

If the PSI identifies a potential for 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 confirm and investigate the extent of any site contamination - usually with the site's proposed land use in mind; or to inform upon appropriate site management strategies.

Soil is most often always tested. Groundwater and/or surface water is tested where the past use has a risk of contributing to its contamination, the soil is contaminated with compounds that can contaminate groundwater, or, if a nearby site is known to be (or is potentially) contaminated and there is a risk of groundwater contamination migrating to the site. DSIs also need to consider other potential contamination pathways such as for landfill gas and volatile vapour intrusion.

The site is generally investigated in accordance with the procedures and requirements found in AS4482 and Schedule B2 of the NEPM, but these may be reduced due to the scope of a particular project (in which case the result may be referred to as a 'limited site investigation').

When the soil is being tested with a particular land use in mind, the concentrations of soil chemicals are generally compared to site investigation levels found in the National Environment Protection Council's "*National Environmental Protection (Assessment of Site Contamination) Measure (NEPM)*".

If the soil is being tested with removal and disposal in mind, then the concentrations of soil chemicals need to be assessed against soil hazard categorization threshold levels for fill and prescribed industrial wastes provided by Environment Protection Authority Victoria (EPAV) Publication 621 "*Soil Hazard Categorisation and Management*".

Where the DSI has been undertaken in accordance with the Australian Standard, or otherwise demonstrates to an acceptable degree of certainty that the site is *not* contaminated, then no further work is likely required. If the DSI 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.

5.3 Other Types of Contamination Investigations

Landfill Gas Risk Assessments

Former landfills are a recognized source of concern to responsible authorities in assessing and approving new uses of land. Councils have, in large measure, identified the location of former landfills within their jurisdiction. Numerous councils, concerned about approving permits in proximity to these former landfills (typically within 500 m), can require proponents to submit a Landfill Gas Risk Assessment (LFGRA) report.

Typically, these progress in a similar fashion as per PSIs and DSIs where a desktop Tier 1 LFGRA is first completed to determine the relative risk of ground gases (such as methane) impacting a site then, if there is a perceived gas risk, completing a Tier 2 LFGRA that involves actual gas sampling and making an assessment of the ground gas values.

Site Validation Reports

As evidence the site is 'clean', or is satisfactory, a report detailing the extent of contamination and the subsequent site remediation works completed (inclusive of post-remediation 'validation' testing) is produced to show that a site has been cleaned 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' is one that may be used relative to a land use that is different to the land use that ***you*** intend it for.

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

Soil Disposal Classification Reports

Soil disposal hazard categorization (classification) reports are a response to the requirements of EPA Victoria's Industrial Waste Resource Guidelines (IWRGs) for the testing and classification of fill and prescribed industrial waste prior to off site management/disposal.

Clean Fill Reports. 'Clean fill report' (sometimes called clean fill 'certificate') is a term used frequently in the civil works industry. It is simply a report attesting to the classification of soil as Fill. Recipients of clean fill reports should ensure that the classification is based upon an understanding of the site history and sufficient lab testing in accordance with EPA Victoria IWRG 702 *'Soil Sampling'* and IWRG 621 '*Soil Hazard Categorisation and Management'*.

Compliance / Monitoring Reports

Frequently, it is necessary for contaminated land practitioners to prepare reports required for compliance purposes, or to periodically monitor the condition of a site.

Compliance reports may be in response to an EPA Notice, License or the requirements of a completed environmental audit (for example: to demonstrate that an audit condition has been met).

Monitoring reports may periodically be prepared on sites in order to track trends in groundwater, soil vapour, and/or ground gas contaminants. This is typical for large sites operating under a works license (e.g. an operating landfill or refinery).

On other sites, groundwater quality management plans (GQMPs) may arise as the result of a concluded 53X audit. A GQMP is a type of contamination management plan put into place where an environmental audit has determined that groundwater pollution exists.

Environmental / Contamination Management Plans

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

An environmental or contamination management plan may be prepared to identify for site users the type, location and degree of contamination, environmental and human health risks, specific site management requirements and any necessary 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 what conditions must be adhered to, or tasks that must be undertaken to ensure that contamination can safely co-exist with the proposed land use (for example, the maintenance of hard surfacing which precludes occupant exposure to contaminants).

Although environmental or contamination 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.

Special Reports

Contaminated land professionals may be called upon to give advice in other areas. Some other examples may include:

- ecological or human health risk assessments
- surface water or sediment sampling investigations
- probabilistic costing estimates
- expert opinion

6 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 can pose a much greater financial liability than other sites having only soil contamination. Land managers and persons considering the purchase of high contamination risk sites need to especially bear in mind the risk of groundwater contamination. Land managers also need to consider if groundwater (contaminated or not) is present at very shallow depths, such that the effects of shallow groundwater may impinge upon construction and development of the site.

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 liquid 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. It is better that this be understood prior to requesting the commencement of an environmental audit. 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 the groundwater environment is divided 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 CUTEP (Clean Up to the Extent Practicable)

In the event that groundwater is polluted (i.e. the water quality is not suitable for its protected beneficial uses), EPA may 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 (following a detailed submission) accept that 'clean up to the extent practicable' has occurred but that some uses are restricted. EPA's acceptance of this outcome is on the basis of a formal CUTEP submission by

an environmental 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 and monitor the residual contamination. A CUTEP submission is required where pollution is due to contamination sourced from the site or, from off of the site and where a beneficial use is considered to be existing or likely.

Groundwater Quality Restricted Use Zones (GQRUZs)

One outcome of the CUTEP process is that EPA will publicly declare that a groundwater quality restricted use zone, or GQRUZ, exists around the contaminated site. The locations of all declared GQRUZs may be searched on the EPA website.

Groundwater Modelling

In cases where groundwater contamination may be unacceptable, it may be necessary to undertake computer modelling 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.

Hydrogeological Assessments

Certain growth area planning scheme amendments have incorporated a requirement that a hydrogeological assessment be submitted along with an application for subdivision. A report is prepared to inform Councils about potential groundwater issues which may influence the subdivision and construction of new estates, such as the presence of shallow groundwater, groundwater dependant ecosystems, or acidity.

In other areas, planning applicants constructing buildings with deep basements need to assess the groundwater effects due to dewatering and subsidence, as well as contamination.

7 ENVIRONMENTAL AUDITS

The term 'audit' is only loosely defined 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 Amendment Act 2018* (Part 8.3) statutory environmental auditors are appointed by the EPA Victoria and have the role of providing:

1. Preliminary risk screen assessments; and
2. Environmental audits.

In Victoria, the role of an environmental auditor is to ensure that audited land meets the specifications for a desired end use. Consequently, they should be independent of the environmental consultant engaged to assess and/or clean up the property.

Audits may be required when a property with a high potential for contamination or an EAO is proposed for a more 'sensitive' land use (e.g. commercial to residential), or a request has been made to remove it from the Priority Sites Register (an official list of badly polluted sites), or it has specific audit requirements under an EPA Victoria notice. A voluntary audit may also be requested where the above triggers do 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.

Under the provisions of the new *Environment Protection Amendment Act 2018* auditors may issue a preliminary risk assessment stating that an environmental audit is required, or not required (a 'streamlined process' envisaged for less complex sites); or a 'regular' environmental audit.

The purpose of an environmental audit is —

a) to assess the nature and extent of the risk of harm to human health or the environment from contaminated land, waste, pollution or any activity;
b) to recommend measures to manage the risk of harm to human health or the environment from contaminated land, waste, pollution or any activity; and
c) to make recommendations to manage the contaminated land, waste, pollution or activity.

Environmental audits may be limited to an assessment of some segment of the environment (e.g. land or surface water) and/or a specific activity (e.g. risks from development of a former landfill).

There may be important exclusions from the audit; however, if the environmental audit assessed the use or proposed use of a site in relation to the risk of harm to human health or the environment from contaminated land, waste or pollution, the environmental auditor's assessment must say if the site is suitable (or not suitable) for the purposes specified in the statement; or indicate what recommendations made in the statement need to be complied with.

Recommendations made in an environmental audit may include items such as maintenance of physical barriers against contamination exposure and the development of such land can proceed if the recommendations are adhered to, or if levels of site contamination are acceptable and in keeping with the proposed land use. Complete and total clean-up of contamination is not always required.

Before an environmental audit may be completed, the environmental assessment and remediation works (if required) must be completed and documented by the site assessor. The time needed to complete the necessary site investigations and environmental audit (contaminated land) report for a site will vary from months to years depending on many factors - but it cannot be done in a few weeks.

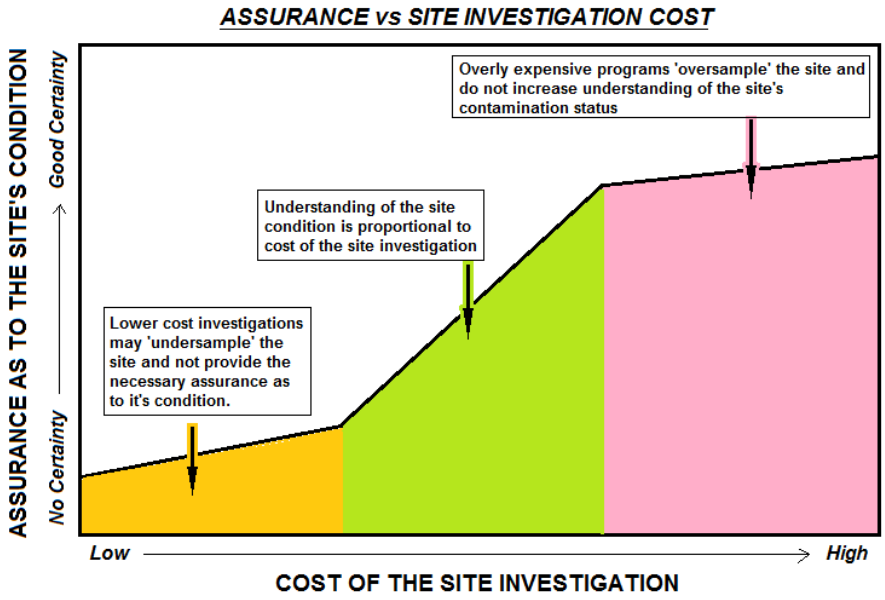
Audits may be terminated prior to completion, however, the appointed auditor needs to provide to the EPA the reason for terminating the audit. EPA generally seeks further information on the contamination status of sites where an audit is terminated.

8 PLANNING OF SITE CONTAMINATION INVESTIGATIONS

Sections 5.1 and 5.2 provided an overview of the generic stages (or phases) of environmental site assessment used by contaminated land professionals. Each successive phase of assessment is intended to build on the information gathered during the previous phase. In practice, however, the preliminary and site sampling phases are routinely rolled together. It is important that your environmental consultant keeps updating their 'conceptual site model' to ensure that the final site investigation addresses the types of contaminants and the exposure pathways present at a site. These may not be fully apparent if commencing a site sampling investigation prior to completing the site history.

8.1 Determining the Right Scope for Environmental Investigation Work

Where you are engaging an environmental consultant to perform an investigation be aware of the relationship between cost and assurance. That is, cheap is not always good and an inexpensive investigation may not necessarily fulfil your needs. Conversely, the oversampling of a site of a site may not provide any meaningful new site characterization data and is unnecessarily expensive. The following chart illustrates.



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 site 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 themselves of your needs and report on the methodology and limitations of the investigation.

The number and type of samples to be obtained and tested (if any) will be driven by the DQOs. A Sampling and Analysis Quality Plan (SAQP) may be developed to document the types of contaminants thought to be present on the site and to provide the field plan for determining the source and the extent of contamination both laterally and vertically to a specifiable degree. Where the site investigation 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 importance when making decisions involving removal of soil for disposal, or planning a development where remediation has significant cost implications.

There are Australian Standards for site investigation which clients should be aware of, particularly AS4482. Where a site is undergoing an environmental audit, this standard may 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 or requesting 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

Although the above recommendations for 'minimum' number of site sampling locations provides a handy comparative and benchmark, the table is somewhat arbitrary and with inherent limitations. It presumes that the site is contaminated and alternative approaches may be deployed to demonstrate that a site is *not* contaminated.

In regards to groundwater, a minimum of three groundwater monitoring wells is required in order to confidently establish the direction of groundwater flow. This is important so that an assessment of 'background' levels of groundwater contamination can be made and to confirm that samples have been obtained down gradient of contaminant 'source' areas. Sites may require a good deal more than three wells in order to fully determine the extent of groundwater pollution at a site (particularly important for CUTEP submissions). In general, there should nominally be one monitoring well for each groundwater contamination source area.

In certain cases, site sampling may not be required to meet the present objective of the site investigation. At a minimum, consumers of contaminated land assessment services should compile the following information prior to requesting a quotation for a contaminated site investigation:

- the reason why the site contamination investigation is being requested
- who the audience of the report is (e.g. council, financier, etc.)
- clear details as to the boundary of the area to be investigated
- any previous site investigation reports or background information

With the above information, your environmental consultant will be able to provide informed advice on the most appropriate scope of site investigation needed to meet your requirements and to indicate the associated limitations.

8.2 Site Remediation Planning

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, or otherwise manageable. Assuming that sufficient site characterization data exists, a remedial action plan (RAP) may be 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);
- site 'acceptance' criteria (i.e. when can the remediation be termed a success?);
- application for and receipt of any necessary permits;
- appropriate provisions for occupational health and safety of personnel; and
- how implementation of the remediation is to be achieved and verified.

In some circumstances the site characterisation data is sufficient to plan the remediation approach, but further investigation may be needed to either refine/minimise the areas of interest or, to gather additional information to prove up the planned remediation approach. These investigations are sometimes referred to as Phase 3 or extent sampling investigations. It is

important to say that costs for remediation work are frequently subject to high degree of uncertainty, even where the site is adequately characterised.

Adherence to the RAP will result in the production of a technically sound report that is suitable for the purposes of the contaminated land auditor, or other stakeholders. In completing the work prescribed in the RAP, excellent planning, constant oversight and an experienced environmental site manager will ensure that costs are contained and controlled to the extent possible.

While the fastest method for clean-up of small amounts of contamination is excavation and disposal of soil, other methods such as bioremediation, thermal destruction and a host of other methodologies are available, but 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 (e.g. soil, groundwater, volatile, non-volatile, etc.).

9 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 has outlined 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. Frequently, the DSI findings are such that a variation for additional investigation is required.

Environmental consultants can provide professional services according to a Schedule of Rates or to Fixed Fee. The benefit of engaging a consultant on a *rates-based* approach is that multiple lump sum variations (to address new findings during the investigation process) are avoided – leading to fewer 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 appraised of any developments necessitating additional costs as they come to light.

On timing, it is generally preferable to have contamination assessments performed before any construction or demolition work 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 unnecessary construction delays while the problem is assessed and a solution worked out.

Another reason for engaging early on with your environmental consultant is to help inform on the project's feasibility. The discovery of an intractable site contamination situation after demolition robs the owner of potential rental income.

Construction delays due to unforeseen contamination issues are expensive and include holding charges, 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 can be 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 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.

10 ASSISTANCE WITH CONTAMINATED LAND

Assistance with contaminated land and compliance with the new Environment Protection Amendment Act 2018 may be had by simply contacting Atma Environmental at the details shown below.

Atma Environmental will meet with property buyers, owners, developers and others to discuss their concerns and options available to them.

56 William Street
ABBOTSFORD, Vic. 3067 Australia
Telephone: (03) 9429 6955

We can also be contacted via our website: https://atmaenvironmental.com