

# A Practical Approach to Assessment and Management of Potentially Contaminated Land

Preventing the Pitfalls - Buying, Selling, Assessing,  
Auditing and Remediating Contaminated Land

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and  
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# Company Background

- Commenced in 1988 – 35<sup>th</sup> anniversary this year
- Solve EHS challenges and build a more sustainable future
- Implement innovative, cost effective solutions
- Services include:
  - Site investigation and remediation
  - Environmental Auditing (Peter is an EPA Appointed Environmental Auditor for Contaminated Land and Industrial Facilities in Victoria and accredited as a Site Auditor in NSW)
  - EHS Auditing and regulatory compliance





# Company Background

- Services Include
  - Air emissions assessment and management
  - Water and wastewater
  - Corporate EHS Due Diligence – Mergers and Acquisitions
  - ESG: Environmental, Social and Governance
  - Waste Reduction and Recycling
  - Water Stewardship and Conservation
- Servicing Melbourne, Sydney and Brisbane, with capabilities to deliver a wide range of projects nationally and internationally (particularly the Pacific region through the Inogen alliance)





# Presentation Overview

## Part One: Buying and Selling Contaminated Land

- Identifying liabilities
- The process of due diligence
- Section 32
- Undertaking an independent environmental investigation



Identifying Liabilities  
Review of Contract  
Reliance on Previous Assessments

## Part Two: Assessing and Auditing Contaminated Land

- Conceptual Site Models
- Preliminary Site Investigation
- Detailed Site Investigation
- Assessing Contaminants
- Risk Assessment
- Engaging Environmental Auditors



Preliminary Site Investigation (PSI)  
Preliminary Risk Screen Assessment (PRSA)  
Detailed Site Assessment (DSI)  
Environmental Audit



Remediation Technologies  
Alternative Land Uses  
Remediation/Management  
Validation

## Part Three: Options for Managing Land Impacted by Contamination

- Mitigating risks
- Managing contaminants



Ongoing Monitoring of Environment  
Soil  
Groundwater  
Air (vapour, ground gases etc.)  
Contaminants (Asbestos, PFAS)

Part one presented by Peter Ramsay, parts two and three presented by Andrew Green

**Note: This presentation is for information only and is not intended to present legal or consulting advice.**



# Part One: Buying and Selling Contaminated Land





# Buying and Selling Contaminated Land



## Identifying Liabilities Prior to Acquisition

- Buying land?

- Consider whether past activities, including the use of nearby land, may have caused contamination at the site.
- Engage a qualified and experienced environmental consultant to undertake an environmental site assessment or an EPA-approved environmental auditor to complete an environmental audit.
- Financial lending institutions are increasingly requiring environmental due diligence before providing a loan.





# Environmental Due Diligence

- The process of environmental due diligence evaluates properties for potential issues such as hazardous materials or petroleum contamination and contaminants in the groundwater or soil of the property.
- Due diligence protects potential land buyers from being held accountable for any pre-existing contamination on the land.

## Common Environmental Risks

- Above ground tanks
- Diesel powered generators
- Interceptors
- On-site treatment plants
- Waste storage
- Hazardous waste
- Historical uses
- Off-site sources





# Environmental Due Diligence- The Key



- Important to obtain adequate information
- Professional assessments and environmental advice
- Commence investigations sooner rather than later
- Risks can be quantified with reliable data
- Be aware of the level of risk you will accept
- Determine preferred development approach
- Also consider less preferable approaches







# Review of Contract

- Review contract in detail
- Seek legal/environmental advice regarding contract conditions related to the environment
- *Statement of Environmental Audit* is not a guarantee of environmental suitability
- Land use restrictions e.g. requirements for ongoing monitoring/management, restrictions on below ground structures or use of groundwater etc.





## Review of Contract/ Section 32

- The Section 32 statement (provided by the seller to the purchaser) must include all information about the property, including information that may affect the state of the property, especially information that may affect the decision of the buyer.

When reviewing contracts beware of statements like:

- *“The Vendor has not made and shall not be construed as having made any representation or warranty that the Property is free of contaminants. Prior to entering into this Contract the Purchaser has made its own enquiries and investigations as to the environmental state of the Property and the Purchaser has relied and relies entirely on the result of its investigations and on its own judgment in entering into this Contract.”*





## Review of Contract/ Section 32

- In some cases, contamination information may be permanently on title. In other words, a search of the title will reveal a contamination problem. The title can include reference to a Section 173 Agreement that is an agreement between council and the landowner.

Be cautious of wording such as:

- *“The Owner must ensure that, at the Owner’s cost, the fill or other material constituting the capping the subject of Clause 2.8 is maintained properly and to the satisfaction of the Council so as to isolate any contamination.”*





# Reliance on Previous Environmental Reports

- If you cannot understand a report, there are often potential issues
- Check report reliance – obtain reliance if possible (there may be a fee)
- You may not be legally entitled to rely on reports - environmental consultants typically only extend liability to the client that engaged them
- Have the report independently reviewed by a qualified professional





# Case Study: Unexpected Finds During Development

- 1.6 hectare site in regional Victoria that was proposed to be subdivided for housing associated with a standard residential land use
- Previous environmental investigation report was provided to purchaser in Section 32, indicating site suitability
- During development of the site rubbish was encountered on the site
- PJRA was engaged to provide environmental advice
  - First stage was to review background information and previous assessments of the site to develop a preliminary CSM
  - Preliminary soil sampling was conducted based on the preliminary CSM
  - The results of the preliminary sampling indicated that the site was contaminated and remediation and further assessment was recommended to address the known contamination and the potential for groundwater to have been contaminated
- Development was put on-hold pending legal action and clean up, EPA was also involved





# Part Two: Assessing and Auditing Contaminated Land





# Assessing and Auditing Contaminated Land Undertaking an Independent Environmental Investigation

Engage an experienced environmental consultant or an environmental auditor to perform the following tasks

- Develop the Scope of the Investigation
- Prepare a site description
- Desktop assessment
- Conduct site investigation(s)
- Conduct contamination assessment
- Prepare a conceptual site model (CSM)

Sufficient investigation will result in the identification of all key hazards and reduces uncertainty/liabilities

Feed findings of investigations into master planning

- Change land uses to minimize remediation
- Divest less contaminated land to generate funds





# Assessing and Auditing Contaminated Land

## Engaging a Consultant

- Often necessary to provide specialist expertise to assist in identifying risks
- Ask for recommendations from colleagues, Auditors
- Typically, about the people involved in the project team, not necessarily the firm
- Focus the decision on someone who you can work with
- Essential to have trust – open collaborative relationship, particularly when problem solving
- Do not engage someone who tells you what you want to hear – when necessary, good consultants tell you what you don't want to hear
- Establish consistent scope – Auditor involvement can help
- Ensure you have pragmatic, skilled people who can deal with groundwater, soil vapour, risk assessment
- Be prepared to step in and manage Consultants if decision making is slow
- Do not focus on initial cost – only part of the equation
- If a quote is cheap, scrutinise it!
- Often costs blow out due to inadequate assessment
- Avoid having to repeat work – do it right the first time



Additional information regarding the engagement of a consultant is provided in **EPA Publication 1702**





# Assessing and Auditing Contaminated Land

## Engaging an Environmental Auditor

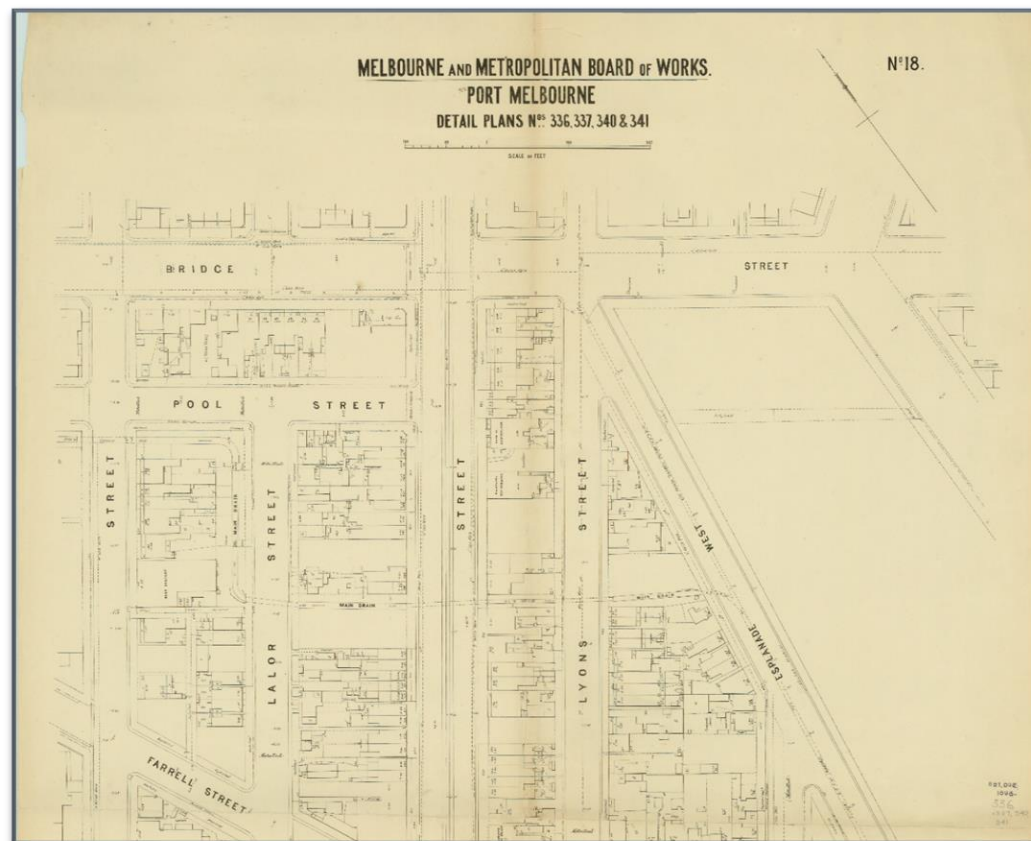
- Often the involvement of an Environmental Auditor is required as a condition of a planning approval or a notice issued by EPA
- Same principles for engagement apply as with a Consultant
- Use the EPA Auditor List as a basis
- Meet the Auditor and their team at proposal stage (face to face, preferably on-site if possible)
- Ensure that the Consultant and Auditor have worked together before and will communicate effectively
- Ensure that the Auditor is accessible and will communicate with all parties
- Maintain a positive relationships with all consultants





# Desktop Review

- A necessary first stage of any assessment
- Desktop review is the gathering and review of available information, which allows the prioritization of further investigation (PSI/DSI), which is a key step where there are many sites and/or limited time/funds for further investigation
- May include the development of a risk matrix with key information on sites (i.e., location, geology, hydrogeology, site history, current activities/hazards, proximity to receptors, compliance history etc.)
- EPA's website includes guidance on key hazards by industry
- May be completed with or without the assistance of a consultant (i.e., consultant could assist with setup and review or complete entire exercise)
- Useful in the development of the scope for any further investigation



Source: State Library of Victoria, 2020





# Assessing and Auditing Contaminated Land

## Conceptual Site Model

- A conceptual site model (CSM) is used to identify any **sources** of contamination, the **pathways** through soil, water or air that the contamination may migrate through, and the human or environmental **receptors** that may be harmed from the contamination.
- A CSM is a key tool in any assessment to identify whether any potential contamination poses a risk to human health or the environment that would result in the land being unsuitable for the current or proposed future land use.



Source: EPA Publication 2010  
Potentially Contaminated Land A guide for business



# Assessing and Auditing Contaminated Land Preliminary Site Investigations (PSI)

Detailed in Schedule 2 of National Environment Protection Measure (NEPM)

## Includes:

- Desktop study (identifying site location, land use, layout, building construction, geological and hydrological setting, historical land uses and activities at the site)
- Site inspection

## Identifies:

- Potential sources of contamination
- Areas of potential contamination
- Potential human and ecological receptors
- Potentially affected media (soil, water, air)

A PSI can only conclude site is suitable if no evidence of potential contamination, or contamination is localised. It provides a 'snapshot' of the site – alludes to whether there are issues which need to be further assessed.





# Assessing and Auditing Contaminated Land

## Detailed Site Investigations (DSI)

Detailed in Schedule 2 of National Environment Protection Measure (NEPM)

### When is a DSI required?

- When the results of the PSI indicate that a contamination is present or is likely to be present and the information available is insufficient to enable site management strategies to be devised

### Includes:

- Sampling Program (Soil, Groundwater, Vapour) - based on CSM
- May incorporate site specific human health risk assessment where elevated contaminant levels are identified
- Necessary to satisfy current Environmental Audit requirements in Victoria

### Identifies:

- The nature of the contamination and delineate its lateral and vertical extent





# Assessing and Auditing Contaminated Land

## Planning triggers for assessment

- Planning and Environment Act 1987 – Section 12 (1A)
  - Ministerial direction No.1 potentially contaminated land
    - Specifies that, in preparing an amendment which allows land to be used for a sensitive use, a planning authority must satisfy itself whether or not the land or parts of the land, are potentially contaminated
    - Before it gives a copy or notice of the amendment under Section 17, 18 or 19 of the Act a planning authority must ensure that an environmental auditor has issued a preliminary risk screen assessment statement stating that an environmental audit is not required for sensitive uses
    - Before it gives a copy or notice of the amendment under Section 17, 18 or 19 of the Act a planning authority must ensure that an environmental auditor has issued an environmental audit statement stating that the land is suitable for sensitive uses





# Assessing and Auditing Contaminated Land

## Preliminary Risk Screen Assessments & Environmental Audits

- The purpose of a PRSA is to:
  - assess the likelihood of the presence of contaminated land;
  - determine if an environmental audit is required; and
  - if an environmental audit is required, to recommend a scope for the environmental audit.

*Section 204 of the Environment Protection Act 2017*

- The purpose of an environmental audit for land use planning purposes is to:
  - assess the nature and extent of the risk of harm to human health or the environment from the contaminated land;
  - recommend measures to manage the risk of harm to human health of the environment from the contaminated land; and
  - make recommendations to manage the contaminated land, waste, pollution or activity

*Section 208 of the Environment Protection Act 2017*





# Assessing and Auditing Contaminated Land

## Level of Assessment for Potential for Contamination

**Table 3: Recommended approach to assessing potentially contaminated land**

Planning Proposal		Potential for Contamination	
		High	Medium
<b>Uses defined in Ministerial Direction No. 1, the EAO, and clause 13.04-1S</b>			
<ul style="list-style-type: none"> <li>Sensitive uses: Residential use, childcare centre, kindergarten, pre-school centre, primary school, even if ancillary to another use.</li> <li>Children's playground</li> <li>Secondary school</li> </ul>	New use, or buildings and works associated with a new use	A	B
	Buildings and works associated with an existing use	B	B
<b>Other land use</b>			
Open space Agriculture Retail or office Industry or warehouse	New use, or buildings and works associated with a new or existing use	C	D

Source: Potentially Contaminated Land – Planning Practice Note 30







# Assessing and Auditing Contaminated Land

## Level of Assessment for Potential for Contamination

	Planning Scheme Amendment	Planning Permit Application
A	PRSA or audit option applies Proceeding directly to an audit is recommended.	PRSA or audit option applies Proceeding directly to an audit is recommended.
B	PRSA or audit option applies PRSA to determine need for audit is recommended.	PRSA or audit option applies PRSA to determine need for audit is recommended.
C	PSI to inform need for audit is recommended	PSI to inform need for audit is recommended
D	Planning authority to document consideration of potential for contamination to impact proposal	Responsible authority to document consideration of potential for contamination to impact proposal
<p>Note: Where land is used for more than one purpose, the most sensitive land use should be used to inform the approach to determining if an audit is required.</p>		

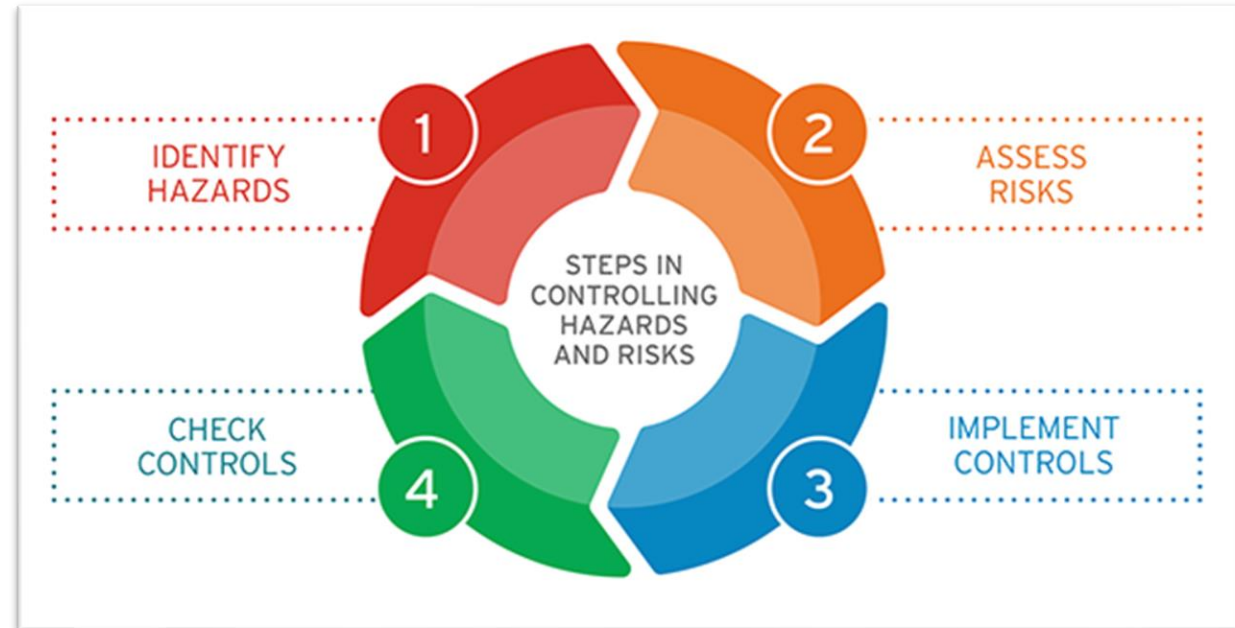


Source: Potentially Contaminated Land – Planning Practice Note 30



# Assessing and Auditing Contaminated Land Risk Management Process

- EPA Guidance on Risk - Assessing and Controlling Risk: A Guide for Business (EPA Publication 1695.1)
- Information on hazards and risks is necessary to fulfil your duties with respect to the management and notification of contaminated land
- The 'implementation' and 'checking' of controls provides for a completed risk management process
- Use the four step 'risk management process' provided in EPA's 'Self Assessment Tool'
- Applies to all activity risk levels, however may be most applicable to 'medium' and 'high' risk activities
- Other aspects which may exacerbate hazards risk:
  - Where there are a large number of sites (even sites with 'low' risk activities)
  - The location of sites (i.e., inner city, near sensitive ecosystems/receptors)
  - The size of site (i.e., large landholdings)
  - Where there are varied activities across sites (where activities/risks may be flying 'under the radar')



Source: EPA Publication 1695.1





# Assessing and Auditing Contaminated Land

## Assess Risks

- EPA publication 1695.1 – Assessing and Controlling Risk: A guide for Business – internal assessment.
- Detailed risk assessment may be necessary where significant contamination is identified
- Site specific assessment of risk for the designated land use
- Must consider risks to both human health and the environment
  - Human Health Risk Assessment (HHRA)
  - Environmental Risk Assessment (ERA)

		Impact			
		0	1	2	3
		Acceptable	Tolerable	Unacceptable	Intolerable
		Little or No Effect	Effects are Felt but Not Critical	Serious Impact to Course of Action and Outcome	Could Result in Disasters
Likelihood	Improbable	Risk Unlikely to Occur			
	Possible	Risk Will Likely Occur			
	Probable	Risk Will Occur			





# Assessing and Auditing Contaminated Land

## Assess Risks

- Consider specific exposure scenarios:
  - Commercial workers
  - Residents (both acute and chronic exposures)
  - Maintenance workers in sub-surface excavations
  - Ecological receptors
- Perform further investigation based on results of the PSI/DSI to allow further understanding of risk:
  - Additional soil/groundwater sampling
  - Continuous monitoring (soil vapour/ground gases)
- Refine the Conceptual Site Model (CSM) based on findings
- Determine if contamination is 'notifiable' per *EP Act 2017* (see EPA Pub. 1940, February 2021)





# Assessing and Auditing Contaminated Land Implementation of Control Measures

- Once assessment of the potential risks has been completed (i.e., following PSI>DSI>risk assessment), control measures must be implemented to address the identified risks
- Control measures may include one or a combination of the following (in order of preference):
  - Elimination of hazard:
    - Including soil and groundwater remediation
  - Engineering controls:
    - Capping and/or containment of contamination
  - Administrative controls:
    - Preparation of a Management Plan to manage contamination
    - Alternate land uses to manage contamination





# Case Study



- Site proposed for residential development
- Site had a former quarry and piggery, with the quarry backfilled
- Site subject to Environmental Audit prior to development
- Initial environmental investigations (completed prior to Audit) indicated a low risk of contamination
- Further investigation of the backfilled quarry was required during the Audit





# Case Study



- Pig carcasses and inert waste were identified in the base of the quarry
- Landfill gas and aesthetic impacts
- Extensive community consultation
- Attention from politicians, media and EPA
- Ultimately all waste was removed at great expense
- Assessment and remediation took 5 years to complete (LFG and GW monitoring required following remediation)





Stockpiled Inert Waste from Quarry





Media Attention Following the Identification of the Odorous Waste



Backfilled Excavation Following Remediation

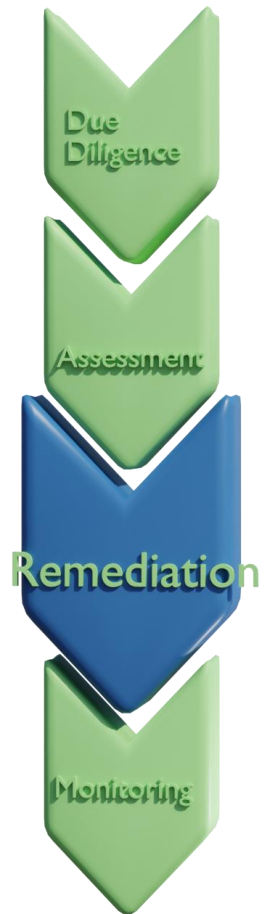
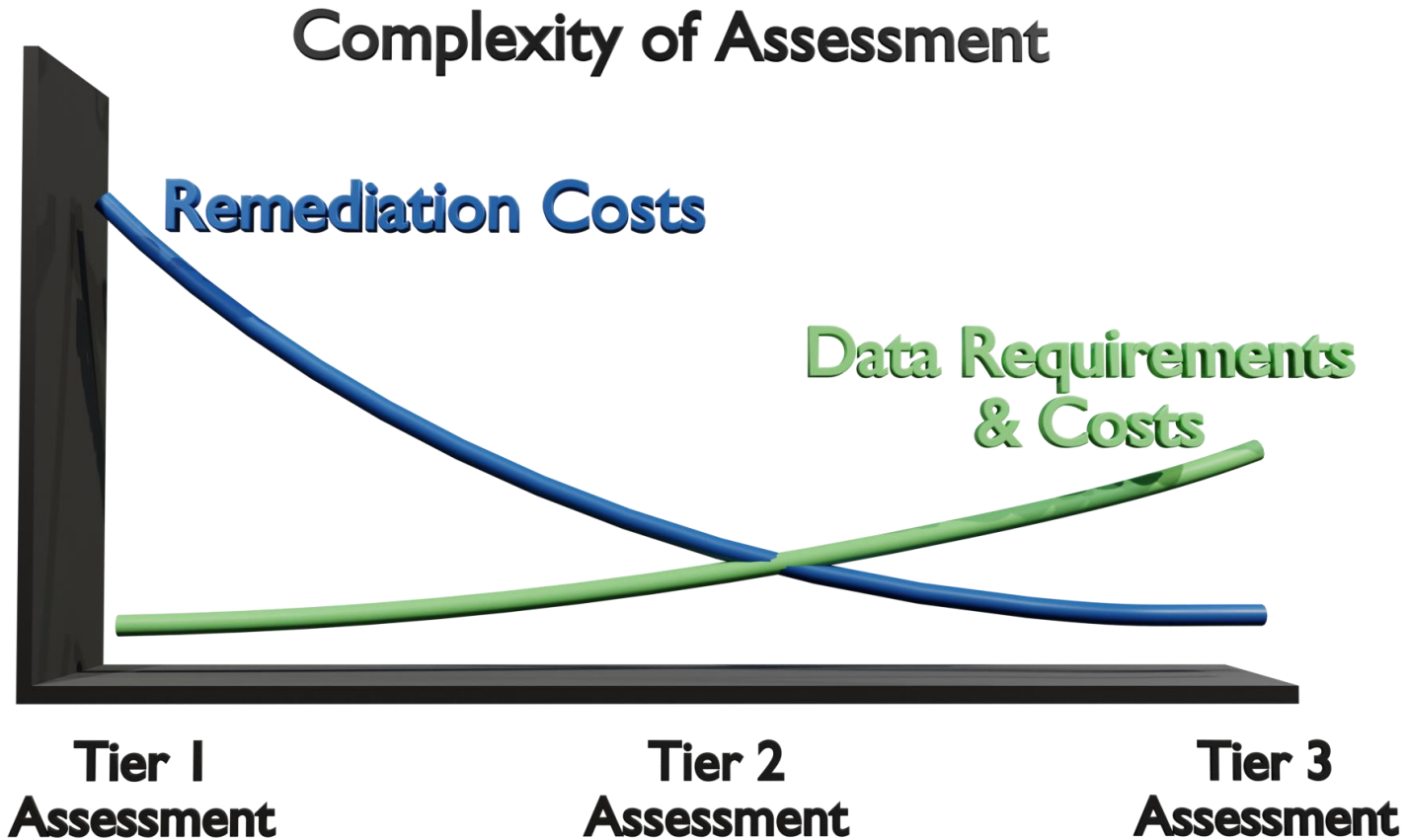


# Part Three: Options for Managing Land Impacted By Contamination





# Investigation vs Remediation



Adapted from CIRIA C665 – Fig. 8.3



# Other Remediation and Management Options

## Dig and Dump

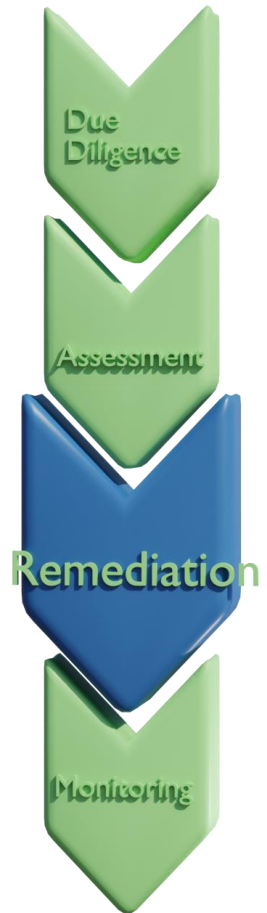
- Excavate soil and dispose of to landfill
- Easy on vacant sites, difficult around infrastructure
- Useful for metals, persistent organics and asbestos
- **Pros:** Easy to implement, good for limited time/space
- **Cons:** High cost:
  - ~\$100/tonne for Category C waste ('gate' price)
  - ~\$350/tonne for Category B waste ('gate' price)
  - ~\$600/tonne for Category A waste ('gate' price)





# Capping and Containment

- At sites where the risks associated with contaminated soils are limited to direct contact exposure, a capping layer may be sufficient.
- For the simplest containment systems, a physical capping layer may be all that is required to prevent exposure to contamination that is present in the soil. The capping layer (or barrier) may take the form of an impermeable covering such as an asphalt or concrete ground surface, a structure (such as a building), or a simple separation layer of clean soil.
- The length of time that the contamination needs to be contained is an important consideration, and the risk that containment fails needs to be assessed. It may be that containment needs to effectively be in perpetuity, or for the life of the development.
- Ongoing monitoring and management measures should be documented and implemented to prevent the release of contaminants from the containment cell over time, and a monitoring plan should include trigger levels and contingency measures that can be implemented if the trigger levels are exceeded.





# Other Remediation and Management Options

## Bioremediation

- Stockpile soil, mix with compost/fertilizer, insert pipes, cover with plastic
- Bugs consume contamination
- Suitable for volatile contaminants such as petroleum hydrocarbons.
- **Pros:** Low cost, easy to design and install
- **Cons:** periodic maintenance and large amounts of space

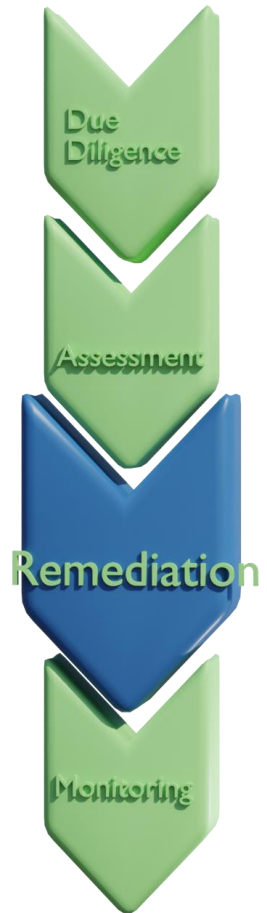




# Other Remediation and Management Options

## Solidification

- Encapsulate contaminants in inert matrix, e.g., cement
- Typically generates a gravelly soil which may be reused on-site (subject to classification)
- Suitable for coarse soils (sands, gravels etc.)
- **Pros:** Relatively inexpensive,
- **Cons:** Need a pilot trial, can take time to implement, need space for batching plant, permitting/permissions may be necessary







# Other Remediation and Management Options

## On-site Treatment

- Includes methods such as incineration, thermal pyrolysis (e.g. Renex), soil vapour extraction, oxidation
- Two new facilities being developed in Melbourne
- **Pros:** Reasonable costs on large scale projects, destruction of contaminant
- **Cons:** Generally not suitable for small sites





# Environmental Management Plans

## Purpose of an EMP in the Context of Contaminated Land

To manage the potential for exposure of site users to residual contamination and/or to maintain separation (barriers)/vapour mitigation systems

Barriers may be as simple as maintaining a hardstand or as complex as maintaining a vapour mitigation system

May be required as a result of environmental audit and is therefore necessary for development (i.e., as a condition of a statement)

May require ongoing monitoring





# Requirements for Ongoing Monitoring

- Following the completion of remediation/containment, ongoing monitoring may be required
- This may include, groundwater, soil vapour, ground gas monitoring
- There are ongoing costs associated with such monitoring
- Further assessment/Auditing may be necessary to cease monitoring





# Case Study: Contamination Identified During Due Diligence

- New facility constructed with infrastructure associated with refuelling vehicles
- PJRA was engaged to conduct due diligence assessment for a client looking to purchase the site
- Given the nature of the activities on the site an intrusive soil and groundwater assessment was undertaken
- The subsurface soil was found to be contaminated with petroleum hydrocarbons due to a fault in the subsurface infrastructure
- Since the issue was identified prior to the sale of the site, the cost of remediation was able to be factored into the contract





# Case Study: Contamination Identified Late

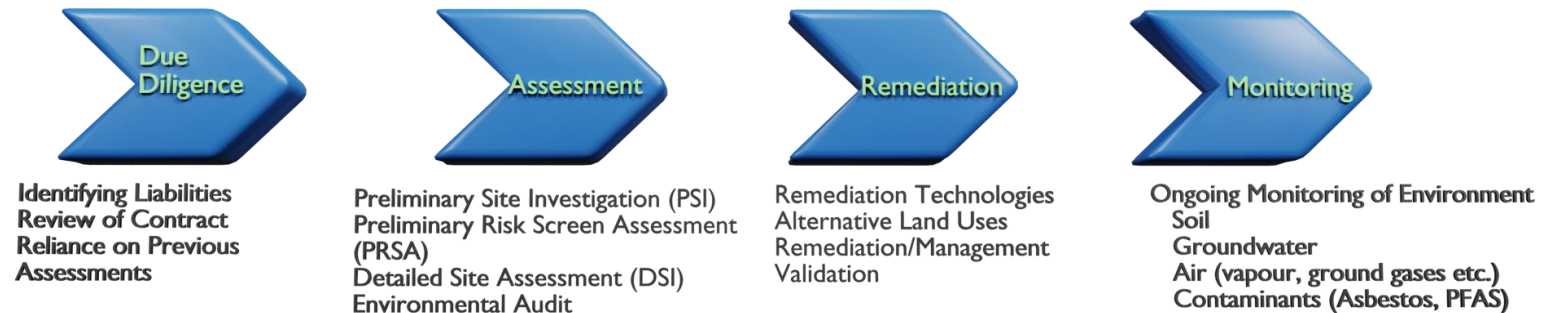
- 1,000 m<sup>2</sup> warehouse in the inner northern suburbs of Melbourne
- The owner of the site was contacted by EPA Victoria regarding petroleum hydrocarbon (incl. LNAPL) contamination identified at a properties adjacent to the site (properties subject to Audit)
- Assessment included
  - PSI – initial understanding, which identified past uses of the site including use of the site for automotive repairs with two disused underground petroleum storage systems (UPSSs), two suspected UPSSs and a hydraulic hoist pit.
  - Soil and groundwater investigation conducted to determine the nature and extent of contamination.
  - Soil Vapour Assessment and Human Health Risk Assessment
  - Clean Up Plan prepared in response to Clean Up Notice from EPA
- Remediation and ‘clean up activities’ included
  - Removal of underground infrastructure and the associated contaminated soil,
  - Multiphase Vacuum Extraction of petroleum hydrocarbon impacted groundwater.
- Validation and Monitoring
  - Groundwater assessment was conducted to ensure that the groundwater contamination was ‘cleaned up to the extent practicable’





# Summary

- Contamination is widespread
- Can have significant impacts on big business, developers, investors, homeowners
- Important to understand risks and make informed decisions
- Seek sound environmental and legal advice to quantify environmental liabilities prior to acquisition or divestment to providing a sound basis for commercial decisions
- Site history must be complete and accurate
- Establish any requirement for statutory environmental audit early so that the auditor can be engaged early
- Costs for remediating contaminated sites will increase over time
- Off-site disposal costs will increase further (limited landfill space, increase in levies etc.)





# Questions?



# Thank you

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