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Environment Protection Authority

*Financial Assurance
Options Analysis
February 2011*

pwc

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Disclaimer

In preparing this document we have only considered the circumstances of the Environment Protection Authority (EPA). Our summary document is not appropriate for use by persons other than EPA, and we do not accept or assume responsibility to anyone other than EPA in respect of our summary document.

Executive summary

The Environment Protection Authority (EPA) currently administers a scheme to fund the expected costs associated with environmental clean up in the event of business insolvency. Such costs include site remediation, site closure and post closure liabilities.

At present, costs are recovered by requiring financial assurances of higher risk licensed businesses – hereafter referred to as scheme participants – that can be called on by EPA when clean up costs are incurred. This minimises the financial expose to EPA and by implication, the financial exposure of the State.

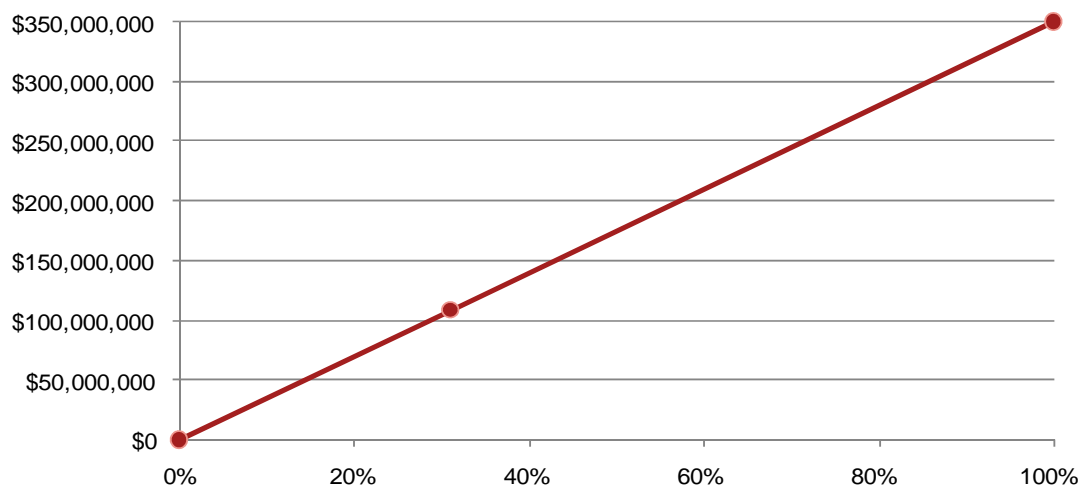
Overview of current and proposed scheme

The first stage of PwC's analysis has been to consider the costs to EPA and scheme participants under the current scheme and under proposed amendments. These calculations form the basis for a comparison of the financial assurance scheme with feasible alternatives.

The proposed amendments have two elements – i) extension of the obligation on scheme participants to provide financial assurance (from around 30 per cent at present to 100 per cent of scheme participants, and ii) development of new formulae for calculating the size of the financial assurance that each scheme participant must provide (which is expected to increase the average contribution per scheme participant by as much as a third).

The total value of financial assurances required of scheme participants – the funds to which EPA has access – is expected to increase from \$109 million to an estimated \$350 million.¹

Figure ES.1: Pro-rata increase in financial assurance



This also forms the basis for estimating the increased cost to business. The incremental direct cost is approximately \$9.6 million ($\$350 \text{ million} \text{ less } \109 million) x 4 per cent. This can be added to the direct costs incurred by those scheme participants who are currently obliged to obtain a financial assurance – estimated to be around \$4.4 million (or approximately \$61,000 on average per scheme participant). The direct costs to scheme participants resulting from an obligation to obtain a financial assurance will increase to approximately \$14 million. The indirect cost – associated with tied up capital, for example – is more difficult to estimate but might have the impact of doubling the total cost.

¹ Financial assurances are almost universally provided via a bank guarantee. These calculations assume scheme participants are charged an average fee of 4 per cent to secure a bank guarantee.

EPA cost exposure

PwC has modelled EPA's expected annual cost exposure resulting from insolvency among scheme participants, using data on the two main variables that drive of the cost exposures:

- frequency of insolvency among scheme participants – there are two sources for this information – observed rates of insolvency among scheme participants and more general insolvency data (provided by the Australian Securities and Investments Commission)
- preliminary estimates of expected clean up costs for the various categories of scheme participants, estimated by GHD as part of its current work with EPA to amend the existing financial assurance scheme.

Table ES.1: Probability and associated cost estimates

Measure	Scenario 1 Insolvency based on EPA historical rate	Scenario 2 Insolvency based on ASIC rate
Max	\$90.4m	\$74.4m
P99.9 ²	\$51.5m	\$32.5m
P99	\$25.6m	\$14.8m
P95	\$13.8m	\$7.9m
P90	\$10.1m	\$0
P85	\$8.0m	\$0
P80	\$6.2m	\$0
P75	\$3.4m	\$0
P70	\$ 0	\$0
Mean	\$2.7m	\$0.9m
Percentage of times a zero result is returned (i.e. there is no insolvency)	74%	91%

While the results should be considered with some caution in light of data limitations, the results of the analysis demonstrate:

- Under Scenario 1, it is expected that insolvency among scheme participants will only occur in three out of ten years; under Scenario 2, insolvency among scheme participants will only occur in one in ten years
- A pool of funds greater than \$10 million would be required under Scenario 1 to provide EPA with 90 per cent confidence of having a pool of funds that provides sufficient coverage in any given year
- The average cost per year is \$2.7 million for Scenario 1 and is considerably higher than the average cost experienced by EPA over the past ten years (\$0.8 million) and indeed, under Scenario 2. This may be due to:
 - limitations in the cost estimates that formed the basis of the analysis – particularly in relation to the hypothetical nature of the estimate and the potential for considerable variance between estimated and actual costs
 - the absence of a large clean up event (e.g. greater than \$10 million) in the last ten years.

The difference between the two scenarios illustrates that the likelihood of insolvency is a key driver of variability within the model; improving the accuracy of this information would considerably enhance the reliability of the outputs.

² Pxx = probability that the corresponding value will not be exceeded in any given year. For example, the P90 for scenario 1 suggests that, according to the model, there is 90% confidence that the cost of clean-up in any given year will be less than \$10.1m.

Options for analysis

PwC has considered the relative merits of the following alternative mechanisms for reducing EPA's cost exposure:

- **Pool of funds** – EPA imposes a levy on scheme participants in order to build up a pool of funds to finance the cost of environmental cleanup.
- **Recovery in arrears** – EPA could recover the costs incurred due to environmental clean up from scheme participants as costs emerge on a yearly basis.
- **Insurance** – EPA takes out an insurance policy to cover the cost of environmental cleanup and recovers the cost of insurance premiums from the industry.

PwC modelling can inform the precise form of each option, the size of the pooled fund, the likely ex post contribution of scheme participants or the volume of funds available through an insurance scheme. Ultimately, EPA has control over these parameters and its choice will depend on factors such as its appetite for risk and the expected impost on scheme participants.

For example, *ex ante* provision of around \$2.7 million would cover the longer term expected annual cost exposure – based on PwC's modelling – but would require EPA to obtain funds from other sources in those years, albeit infrequent, where actual payouts exceed expected payouts. EPA could levy a higher amount to accumulate a fund that could cover less frequent incidents but this results in a higher cost to industry.

Similarly, a policy decision to only recover some proportion of costs from scheme participants after an insolvency means EPA is exposed to the residual cost.

The costs to EPA – and therefore, scheme participants – of obtaining insurance, and the likely conditions under which it might be provided, are likely to preclude its implementation. For example, a private insurer would be expected to demand a high premium for what would be a unique, customised product. Moreover, it would likely insist on significant exclusions – refusing to provide for illegal or unlicensed activities – ongoing oversight of EPA's monitoring and enforcement activities, and forensic examination of insolvencies to identify whether any commensurate costs could have been avoided.

This figure plots the expected performance of each option in terms of its expected cost to scheme participants and the adequacy and timeliness of funds it provides to EPA.

Figure ES.2: Cost vs adequacy of funds

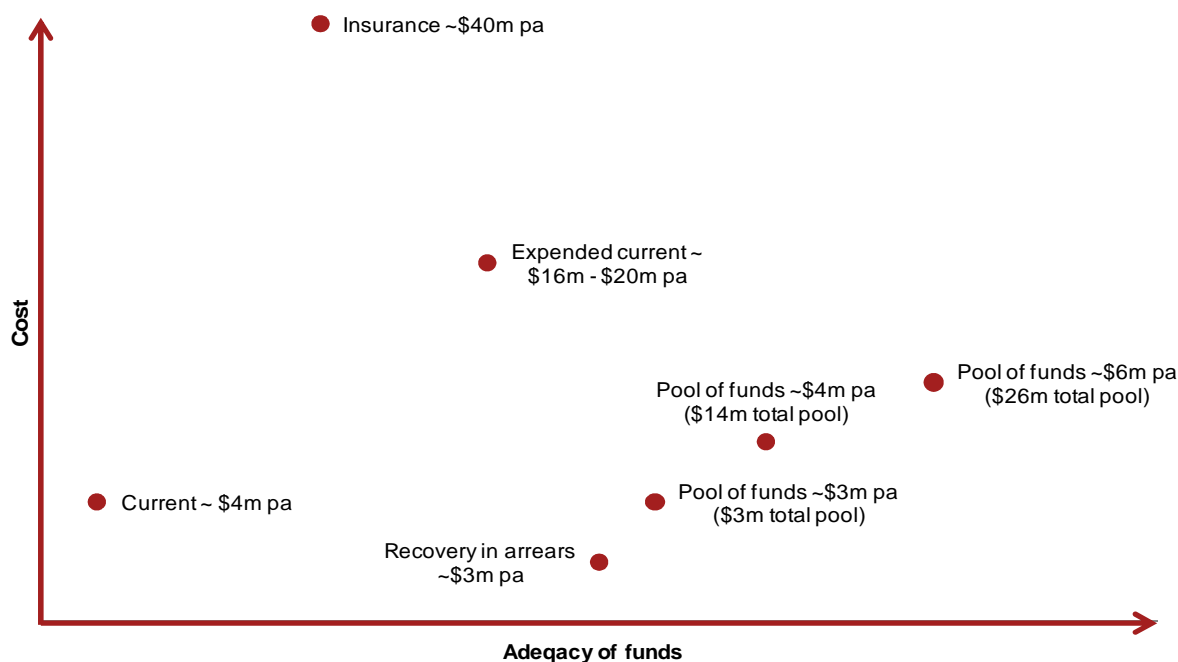


Table 8ES.2 demonstrates that this cost only applies to the 72 sites that have obtained a financial assurance, the EPA is exposed to the full costs of clean up at the other sites in the event of insolvency.

Table ES.2: Average estimated cost per participant (pa)

Option	Number of participants	Total Cost (pa)	Average cost per participant (pa)
Current scheme	72	\$4m	\$61k
Expanded current scheme	245	\$16-\$20m	\$65 – \$81k
Option 1a: Pool of funds (\$2.7m pool)	245	\$2.7m	\$11k
Option 1b: Pool of funds (\$14m pool)	245	\$4m	\$16k
Option 1c: Pool of funds (\$26m pool)	245	\$6m	\$24k
Option 2: Recovery in arrears	245	\$2.7m	\$11k
Option 3: Insurance	245	\$40m	\$163k

The average cost per participant is expected to vary based on factors like size, past compliance etc.

The following are the primary advantages of the pool of funds option:

- Create a payment expectation among scheme participants; contribution to a pool of funds, even for those not captured by the current financial assurance scheme, becomes a cost of doing business in Victoria.
- A formula based contribution that takes account of each participants' specific characteristics is an objective and certain mechanism for recovering costs.
- *Ex ante* provision means any scheme participant that generates costs as a result of their insolvency has made some contribution towards the recovery of those costs.
- EPA has greater control over the administration of the fund, including the development of rules regarding access. This means it can explicitly include any costs attributable to unlicensed or illegal activity (assuming they can be disentangled). This is unlikely under the insurance or at the very least, would come at considerable cost.

The following are the primary disadvantages of the pool of funds option:

- It is likely to require greater administrative costs, largely due to design, funds management and oversight.
- EPA would need to consider the process for accumulating the fund over a period of time. Some options may require a disproportionate contribution from some scheme participants during the initial years, ie until the fund is built to the desired level.
- EPA would need to consider access to funds where the pooled fund is insufficient to cover a less frequent incident of substantial cost.

The following are the primary advantages of *ex post* recovery:

- EPA has flexibility in determining what proportion of costs it might seek to recover and the period over which recovery might occur.
- The longer term average contribution per scheme participants is likely to be lower under this option as it only seeks to recover actual costs.
- Less capital is tied up than under the pool of funds option; scheme participants are not obliged to pay for EPA uncertainty about its cost exposure.
- EPA avoids the costs associated with funds management and oversight.

The following are the primary disadvantages of *ex post* recovery:

- As there may be some delay in actually recovering costs, EPA would need to develop a process for obtaining funds in the short term (for urgent clean up activities, for example).
- Scheme participants are subject to considerable uncertainty about their expected contribution. The option does not create the expectation of a regular contribution, which may create opposition to any contribution, irrespective of its size.
- The scheme participant responsible for generating costs through its insolvency makes no actual contribution to their recovery.
- This options places considerable onus on EPA to demonstrate the effectiveness of its monitoring and enforcement activities so as to avoid creating the perception among scheme participants that costs could have been easily avoided.

Introduction

The choice of preferred option will depend on design and practical administration. Ultimately, many of these issues – the proportion of costs to recover, residual cost exposure, size of fund, for example – are policy decisions. EPA will need to consider the trade off between the slightly higher cost of a pool of funds and intergenerational issues with the payment variability and equity issues of the recovery in arrears option.

While the pool of funds creates a payment expectation, is less variable for industry and requires some contribution from the responsible party; these factors will need to be weighed up against the lower cost and elimination of intergeneration issues of the alternative.

On balance, PwC views the pool of funds option as the most cost effective and administratively sustainable option. The certainty and flexibility for EPA in terms of the funds available for environmental clean up are its key attributes; both of these factors are much less certain under the alternatives. Similarly, the longer term certainty it provides for scheme participants and the clear expectation of regular contributions are important considerations.

Next steps

GHD's work to estimate clean up costs for each category of scheme participant will become, when completed, an important input to the calculation of EPA's expected cost exposure. EPA will also need to consider and determine its policy position with respect to the implementation and administration of the two conceptual approaches. This relates to matters such as the size of any pool of funds, the scope of activities and the proportion of costs it is intended to cover.

Any move away from the current financial assurance scheme needs to be considered in light of EPA's preference for polluters to directly contribute to environmental clean up. Under the current scheme, scheme participants do not contribute to the recovery of costs generated by other scheme participants but PwC's analysis demonstrates that this comes at great cost as the total amount tied up in financial assurances is equivalent to some estimation of the costs EPA would incur if every participant were to become insolvent.

A related issue of any move away from the current scheme is that of moral hazard. In this context, a pooled approach can potentially have a distorting influence on the market and the incentives of scheme participants to comply with their licence conditions; they know that they will not be directly exposed to the cost of environmental clean up in the event of their insolvency and their contribution, while solvent, is relatively small.

In practice, PwC does not expect this to be a strong driver of scheme participants' behaviour. Rather, their compliance with licence conditions and regulations will be driven by factors such as EPA's regulatory administration and penalty regime, the participant's concern for its reputation with respect to environmental outcomes.

Therefore, EPA's approach should incorporate two elements:

- effective monitoring and enforcement of licence conditions and development of an appropriate and proportionate penalty regime.
- exhaustive pursuit of assets of companies in liquidation to honour liabilities prior to pursuing funds through some other mechanism (a pool of funds or insurance policy, for example).

1 Introduction

The Environment Protection Authority (EPA) currently administers a scheme to fund the expected costs associated with environmental clean up in the event of business insolvency. Such costs include site remediation, site closure and post closure liabilities.

At present, costs are recovered by requiring financial assurances of higher risk licensed businesses that can be called on by EPA when clean up costs are incurred. This minimises the financial expose to EPA, and by implication, the financial exposure of the State.

1.1 Scope of the project

EPA has engaged PricewaterhouseCoopers (PwC) to consider alternative mechanisms to manage this financial exposure in a more effective and efficient manner. This paper considers some alternative schemes, having regard to factors such as the adequacy of funds, the impost on business, cost to Government, and equity outcomes or incentive structures for regulated businesses.

The project comprises two stages:

- 1 **High level assessment** – which examines a broad range of feasible mechanisms in order to prioritise the options and recommend a short list for more detailed analysis, having regard to each option's performance against agreed assessment criteria
- 2 **Detailed assessment of shortlisted options** – which assesses the short listed options in more detail to give consideration to the actual implications of using each of the mechanisms considered, and how they would be implemented in practice.

These options are considered in the context of EPA's policies and regulations regarding the handling and use of hazardous chemicals or certain activities, such as the operation of a landfill site. This report does not revisit the costs and benefits of these existing regulatory frameworks or the extent to which they achieve policy objectives in an efficient and effective manner. Neither does this report consider the merits of the policy decision to recover some proportion or all clean up costs from businesses that undertake certain activities (ie the scope of the current financial assurance scheme).

Rather, it recognises that mechanisms for minimising EPA's exposure to clean up costs are one component of its broader regulatory activities, which include the specification of regulatory obligations and standards, and monitoring and enforcement activities. Indeed, these are also mechanisms for reducing potential clean up costs – by reducing the volume and scope of certain activities or the extent and consequences of illegal or unlicensed activities.

In addition to considering the relative merits of alternatives mechanisms for reducing EPA's cost exposure, this report identify the steps necessary to begin a process of change from a financial assurance scheme to an alternative scheme in the future. This includes further data collection and analysis – relating to the specific characteristics of licensed entities and expected clean up costs – and observed outcomes following minor modifications to the current scheme (which are likely to occur in 2011).

1.2 Contents of this report

PwC previously prepared an interim report for the EPA executive team that included a high level assessment of a broad range of options (stage 1). This led to the identification of three options for more detailed assessment, as listed below:

- a pooled fund to which EPA would have access in the event of insolvency
- recovery of actual costs from industry following insolvency
- an insurance policy taken out by EPA that could be drawn on in the event of insolvency.

Each of the short listed options has been compared to the current administration of the scheme (defined as the 'base case') to facilitate a consistent and reasonable assessment.

Our analysis also takes account of potential modifications to the current scheme that are currently being considered by EPA, as an alternative point of reference. These changes are taking place in the short term to ensure greater coverage of the financial assurance scheme (in its current form) and therefore, a lower level of financial exposure for EPA.

This report focuses on the results of the detailed assessment of the short listed options and discusses issues of transition and implementation, governance and ongoing administration under each option.

Introduction

It also considers how each option could be improved or streamlined into the future, most likely through the collection of data or further analysis of licensed entities. This analysis would provide greater insight into EPA's expected exposure to clean up costs from one year to the next – size and frequency, for example – the size of any *ex ante* provision or efficient mechanism through which those costs are recovered from industry. At present, the analysis relies on GHD estimates of the costs associated with the clean up of sites covered by the current scheme, observed and expected insolvency rates and a range of simplifying assumptions (which are clearly identified in the accompanying text).

Appendices to the report provide further information on:

- **Appendix A:** The consultations undertaken with:
 - the Victorian Managed Insurance Authority (VMIA)
 - the Environment Protection Authority's Financial Assurance Working Group
 - the Department of Sustainability and Environment (DSE)
 - prominent Australian insurance provider.
- **Appendix B:** Other options considered as part of the high level assessment
- **Appendix C:** The broader licensing scheme
- **Appendix D:** Past clean up costs
- **Appendix E:** Schemes implemented in other jurisdictions
- **Appendix F:** Schemes implemented in other industries
- **Appendix G:** Modelling methodology used by the detailed assessment
- **Appendix H:** Average insurance premium and claim data
- **Appendix I:** GHD cost estimates.

2 Recap of the current scheme

EPA incurs costs associated with environmental clean up when a business becomes insolvent, leaves behind hazardous waste and is unable to clean up the waste themselves. These costs result from site remediation, site closure and post closure liabilities.³ The objective of the current financial assurance scheme is to limit EPA's cost exposure and by, implication that of the State.

The current scheme of financial assurance has been in place (in some form) since the 1988 amendment of the Environment Protection Act 1970 (the Act).

EPA's administration of the scheme to this point – in terms of the size of the financial assurance it requires for business and its decision to selectively apply the requirement of licensed entities to obtain a financial assurance – has two implications. Firstly, the total impost on business is lower than what would be the case under a broader application of the financial assurance obligation. Secondly, EPA remains exposed to the costs generated by business insolvency.

2.1 Current operation

The Act allows EPA to require financial assurances from entities operating specific scheduled premises with a works approval or licence, from herein referred to as scheme participants.⁴

The Act provides some flexibility in terms of the form of the financial assurance by stating that a financial assurance may include the following:

- letter of credit
- certificate of title
- personal guarantee
- bank guarantee
- bonds
- insurance
- any other form of security agreed to by EPA.

In practice, EPA must agree to the form of the financial assurance and to this point, almost all financial assurances obtained to date have been in the form of a bank guarantee due to the greater certainty they provide.⁵

Some businesses have sought to obtain insurance but have not been able to satisfy EPA of the adequacy of the proposed arrangement agreed to the terms and conditions of the proposed insurance policy.

³ The scheme in its current form is not designed to cover all potential future cost related to environmental clean up. This is discussed further under 'amount' and 'EPA exposure' below.

⁴ The specific scheduled premises refer to those that may be required by the EPA to obtain a financial assurance, set out in the Environment Protection (Scheduled Premises and Exemptions) Regulations 2007. These scheduled premises are defined as A01 (Prescribed Industrial Waste Management), A05 (Landfills), G04 (Bulk Storage), G05 (Container Washing), L02 (Contaminated sites-onsite soil containment), and L04 (Contaminated sites-long term management).

⁵ There have also been some instances where large businesses have placed funds in trust as an EPA agreed form of financial assurance.

Recap of the current scheme

Amount of the required financial assurance

At present, EPA has only published guidance for the calculation of the required financial assurance for landfills and prescribed industrial waste (PIW) sites. This guidance material – published in 2001 and 2006 – includes a formula for determining the potential clean up costs for each site and therefore, the required financial assurance. The estimation of potential cost is based on licence conditions, site and activity characteristics and cost data (some of which was defined in the guidelines and some of which is determined by market rates at the time of application).⁶

This methodology has a number of limitations relating to the amount it is able to recover. For example, it does not incorporate costs attributed to EPA management of the clean up process. Similarly, the methodology is not able to provision for instances where scheme participants breach conditions of their licence and stockpile material. As such, the financial assurance for these scheme participants may not be sufficient to recover all costs generated by their insolvency.

Access to funds

The financial assurance obligation applies on a site rather than business basis. Assurances are calculated on a per site basis and hence any business operating several sites has to obtain a financial assurance for each site.

Site based financial assurances only provide funds for clean up related to that site and only up to the amount calculated with the methodology discussed above. The financial assurance is ring fenced so despite the impost on business and the policy desire for regulated industry to make some contribution to costs, EPA cannot access these funds if a licensed entity that does not hold an assurance becomes insolvent. Similarly, EPA cannot draw upon other financial assurances when actual clean up costs exceed the amount provisioned through a financial assurance.

Scheme participants may have not obtained financial assurance

EPA is exposed to potential clean up costs for scheme participants that have not been required to obtain financial assurance.

Of the current scheme participants with a licence, only some proportion of prescribed industrial waste (PIW) and landfill operators have been required to obtain financial assurance; 27 per cent and 55 per cent of PIW and landfill operators respectively (as illustrated in Table 1).

In total, 31 per cent of licensed scheme participants have been required to obtain a financial assurance, all of which have been landfills or businesses using prescribed industrial waste.⁷ This equates to financial assurances adding to a total of \$109 million.⁸

⁶ GHD is currently working with EPA to refresh these formulae and to develop formulae for other scheme participants.

⁷ Environment Protection Authority, Financial Assurance Reform Strategy, September 2009.

⁸ Based on a customised data spreadsheet sent to PwC on 7 October 2010 outlining the financial assurance amounts by client name and licence type.

Recap of the current scheme

Table 1: Licence and works approval scheduled premises

Category	Type	Total scheme participants	With FA	Without FA	Percentage
Licensed Scheduled Premises	A01: Prescribed Industrial Waste Management	169	46	123	27%
	A05: Landfills	47	26	21	55%
	G04: Bulk Storage	11	0	11	0%
	G05: Container washing	2	0	2	0%
	L02: Contaminated sites – onsite soil containment	0	0	0	n/a
	L04: Contaminated sites – long term management	0	0	0	n/a
Works Approvals Scheduled Premises	A01: Prescribed Industrial Waste Management	12	0	12	0%
	A05: Landfills	2	0	2	0%
	G04: Bulk Storage	2	0	2	0%
	G05: Container washing	0	0	0	n/a
	L02: Contaminated sites – onsite soil containment	0	0	0	n/a
	L04: Contaminated sites – long term management	0	0	0	n/a

This leaves 123 PIW operators, 21 landfill operators and 13 other operators that have not been required to obtain financial assurance. None of the 16 scheme participants with works approvals have been required to obtain financial assurance

As the financial assurance calculations have not been completed for the remaining 69 per cent (and no guidance or formulae exist to calculate the value of the financial assurance in some instances), the total amount that could be required by EPA is unclear.

PwC is not aware of the policy rationale for the selective application of the financial assurance obligation. We expect however that it is a pragmatic response that recognises the risk profile and characteristics of the regulated population, difficulties associated with obtaining an adequate financial assurance and the impost on business.

PwC understands that EPA has not undertaken any formal analysis of the size of this exposure, either in terms of the potential for business failure among those entities nor the magnitude of the clean up costs that would be incurred if any of those entities were to fail. A simple pro rate estimation of this exposure results in a figure of \$350 million. This calculation simply assumes that the average financial assurance amount required of the scheme participants that have not been required to obtain financial assurance is the same as the scheme participants that have been required to obtain financial assurance. Therefore, the calculation is as follows: \$109 million/31% = \$350 million.

Costs may exceed provisioned amount

As a final point, clean up costs may exceed those provisioned under the current financial assurance calculation for the following reasons:

- inadequate provision
- un-provisioned costs
- costs not able to be provisioned
- unforeseen costs.

Recap of the current scheme

Each is briefly considered below:

Inadequate provision – exposes EPA to potential costs as some of the costs used in the financial assurance calculation do not reflect current market prices. Recent discussions with GHD suggest actual costs may exceed estimated costs by as much as a third in some cases. For example, a certain cost component in the calculation might be \$200 per tonne, whereas the current market price might be around \$300 per tonne. If accurate, the estimated residual exposure of \$350 million (estimated above) would be a lower bound.

Un-provisioned costs – exposes EPA to costs where the financial assurance calculation does not include costs components that can be incurred by EPA. As mentioned, the current financial assurance calculation does not account for EPA management costs, which it frequently incurs as part of the clean up process.

Costs not able to be provisioned for – EPA does not attempt to provision for costs attributed to illegal or unlicensed activity when calculating financial assurance amounts, and EPA is exposed to costs should illegal or unlicensed activity occur. The magnitude of these costs may be substantial and potentially well beyond the scope of any reasonable scheme to provision for. While EPA's associated exposure can be managed to some extent through effective monitoring and enforcement activity and an appropriate penalty regime, illegal or unlicensed activity can never be fully eradicated. Increased compliance will however decrease the potential cost of clean in the event that a business later becomes insolvent.

Unforeseen costs – EPA is exposed to costs beyond that provisioned through the financial assurance. Cost may be more than provisioned for due to unforeseen or extraordinary circumstances. For example, abnormal weather conditions that cause extensive spreading of the hazardous waste may result in the costs of clean up exceeding all reasonable expectations.

Summary

EPA remains exposed to the costs of environmental clean up where scheme participants have not been required to obtain financial assurance or where there is inadequate provision, un-provisioned costs, costs that were unable to be provisioned for or unforeseen costs.

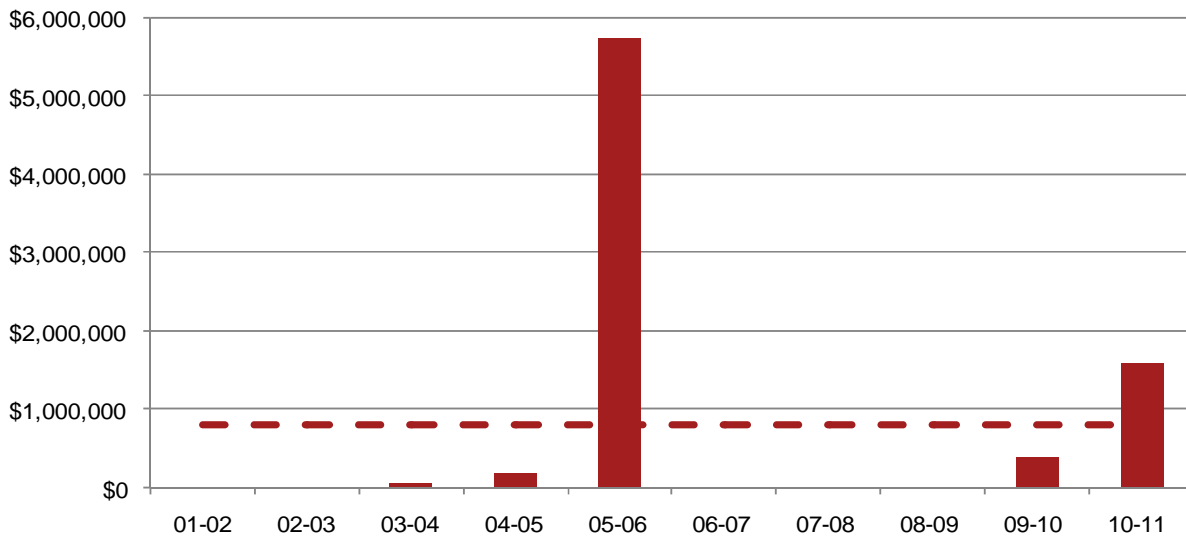
2.2 Observed clean up costs

Observed outcomes provide **some** indication of EPA's future cost exposure, in terms of the frequency of insolvency and the subsequent quantum of costs. This should however only be one input to or a possible point of reference for any sophisticated analysis of future exposure.

Over the last 10 years, there have been four incidents where EPA has incurred environmental clean up costs for insolvent businesses. EPA has not maintained detailed records of the costs incurred as a result of these incidents so there are some questions about their accuracy. However, available information indicates EPA has incurred estimated costs of around \$8 million over the past 10 years, or \$800,000 on average per year (as shown in Figure 1).⁹

⁹ A description of each of the incidents is provided in appendix D.

Recap of the current scheme

Figure 1: Past cost of clean up incurred by the EPA in relation to insolvency businesses

In each case, EPA was unable to draw on a financial assurance to recover these costs as no financial assurance had been required of the businesses.

A breakdown of the estimated costs related to these incidents is set out in Table 2.

Table 2: Environmental clean up costs incurred by EPA (2000 to 2010)

Incident	Costs incurred to date	Anticipated costs in the future	Total expected cost
Jancassco	\$6.33 million		\$6.33 million
EcoChem	\$0.02 million	\$0.36 million	\$0.38 million
Drum Brokers	\$0.06 million	\$0.36 million	\$0.42 million
Leigh Street	-	\$0.88 million	\$0.88 million
Total	\$6.41 million	\$1.60 million	\$8.01 million

Note: that cost data in this table is considered to be unreliable and is therefore only used as a guide.

Source: EPA customised Excel spreadsheet sent to PwC.

These incidents – and the Jancassco incident, in particular – provide some indication of EPA's future exposure, both in terms of the frequency of insolvency and the commensurate clean up costs. EPA's exposure however is greater, given the scale and type of activity it regulates. One recent example of an incident that could expose EPA to much higher costs relates to a situation at the Cranbourne landfill.

Recap of the current scheme

Cranbourne landfill incident

In 2008 an emergency situation occurred when the Cranbourne landfill, operated by the City of Casey, began to emit dangerous quantities of landfill gas into a nearby housing estate. This led to the temporary evacuation of residents and urgent site rectification to maintain public safety. The City of Casey and EPA have continued to make improvements to the landfill cap – and incur costs – and the situation is continuing to be monitored following the return of residents to the area.

It is estimated that the cost of managing the situation at Cranbourne landfill up until a time when it no longer represents a risk to the environment and local community will be around \$100 million.¹⁰ This far exceeds the expected environmental clean up costs expected for this type of landfill. In the instance that a financial assurance had have been required, the current calculation would only have required an estimated financial assurance of around \$3 million, around \$97 million short of the expected total cost.

While illustrative, there are some factors to consider when evaluating whether the estimated \$100 million clean up fee indicates EPA's potential cost exposure and therefore, whether it is reasonable to provision for this through a financial assurance scheme. They are as follows:

- The City of Casey, rather than a private business, is the operator of the site and as such, is unlikely to be declared insolvent in practice. It has however received State Government financial assistance to manage the site. This raises the broader issue of the appropriate treatment of local government under the current scheme and any reasonable alternative scheme
- Some proportion of the expected \$100 million costs is generated by the need for immediate action to maintain public safety – the relocation of residents, for example. This situation appears quite unique and it is not clear that EPA would seek to include similar costs in any general calculation of the financial assurance required by most sites across Victoria. EPA's actual contribution to the clean up of the Cranbourne site has been \$4.7 million (arising from management, oversight and the issue of a grant to the City of Casey).

In summary, EPA has incurred around \$8 million of costs over the past ten years under the current scheme, however, the potential for larger events to occur – similar to Cranbourne for example – has implications for the expected average yearly cost for EPA resulting from insolvencies.

2.3 Operating costs of the current scheme

The cost of the current scheme includes both direct and indirect costs incurred by Government and industry (scheme participants).

2.3.1 Government

Government incur costs related to operating the current scheme. Current operating costs for the scheme primary include the salary and oncosts of one permanent EPA staff member. This staff member currently undertakes the vast majority of roles related to operating the financial assurance scheme including the determination of new financial assurance proposals, meetings with licensed entities, undertaking of compliance action and record keeping.

Other parties are involved in the financial assurance scheme from time to time, including the legal team, execute management, regulatory innovation team and the financial assurance working group. Therefore, a reasonable estimate of the total costs to EPA of administering the scheme in its current form is in the order of \$200,000 to \$300,000 per annum.

¹⁰ EPA estimate.

Recap of the current scheme

2.3.2 Industry

To date, the vast majority of financial assurances have been taken out in the form of bank guarantees, which imposes both direct and indirect costs on scheme participants. The total impost on business is determined by the scope of the scheme. In other words, any extension of the scheme – to those licensed entities that have not previously been obliged to obtain a financial assurance under the current administration – will necessarily increase that impost.

Direct costs result from bank charges to maintain a guarantee. While the amount charged in each case varies depending on the bank and risk of applicant insolvency, most businesses incur a cost of around 3 per cent to 5 per cent per annum.

In some instances local councils with good credit ratings and a low chance of becoming insolvent have been able to negotiate rates as low of 0.5 per cent per annum. Nevertheless, councils account for a small percentage of entities that must obtain a financial assurance.

A simple calculation of the direct costs to scheme participants is around \$4.4 million per annum (an average of around \$61,000 per scheme participant), based on the current dollar amount of financial assurances held on behalf of EPA.¹¹

In addition, the requirement to provide banks with security over an asset in order to obtain a bank guarantee also places indirect costs on those scheme participants obtaining a bank guarantee, as it ties up fund that cannot be otherwise used for other purposes. While it is difficult to estimate the opportunity cost for business associated with their subsequent loss of borrowing capacity or increased borrowing costs, this may even have such an impact as to double the total cost for some entities. Furthermore, this will likely have a disproportionate effect on smaller scheme participants.

¹¹ \$109 million x 4 per cent = \$4.4 million

3 Recent developments

The current financial assurance scheme has been the subject of a number of recent internal and external reviews on matters such as current administrative practices, the adequacy of provision and its coverage.

In 2008, Pitcher Partners was engaged to undertake an internal audit of financial assurance management process for the benefit of EPA management and board. The report concluded there were a number of areas where EPA management should take action, including policy and procedural guidance documentation, financial assurance recording mechanisms, scheduled financial assurance review process and procedures, and technological systems and mechanisms.¹²

More recently in 2010, the Victorian Auditor General released its audit summary on hazardous waste management, which concluded there was 'little assurance that hazardous waste is stored and disposed of appropriately'. It also stated there was 'no clear rationale for the limited use of financial assurance that protects the state from bearing the costs of non-compliance'.¹³

This project is one aspect of EPA's response to these issues and is focussed on analysing feasible alternatives to the current financial assurance scheme. EPA has also commenced work to consider how the current scheme might be amended in the short term to improve its operation and to better reflect EPA's likely exposure the cost of environmental clean up.

The likely output of this work and its implications for regulated entities – most notably, in terms of cost – are considered in more detail in the remainder of this chapter.

3.1 Short term modifications of the current financial assurance scheme

EPA is currently working with GHD to estimate the likely costs associated with site remediation, site closure and post closure liabilities and to develop a process for calculating the necessary financial assurance for all entities captured by the scheme. At present, EPA's exposure to the costs of clean up is influenced by the following:

- the decision to only require financial assurances from 31 per cent of licensed scheme participants
- the current formulae for calculating the financial assurance required by those participants relative to the actual costs incurred if any of those entities were to be declared insolvent.

One element of EPA's response to the concerns identified above is the in principle decision to extend the financial assurance obligation to the 69 per cent of scheme participants that have, to this point, been exempt from this obligation. If implemented, this will increase the number of scheme participants with a financial assurance from 72 (31 per cent) to 245 (100 per cent).

The proposed extension will have the following effects:

- Increase the likelihood that EPA can recover the costs associated with environmental clean up. EPA will be able to access funds in the event that any of the 69 per cent of licensed scheme participants are declared insolvent, which it cannot do at present
- Increase the total impost on regulated businesses as scheme participants previously exempt from the financial assurance obligation will now incur direct and indirect costs (most likely the result of having to obtain a bank guarantee).

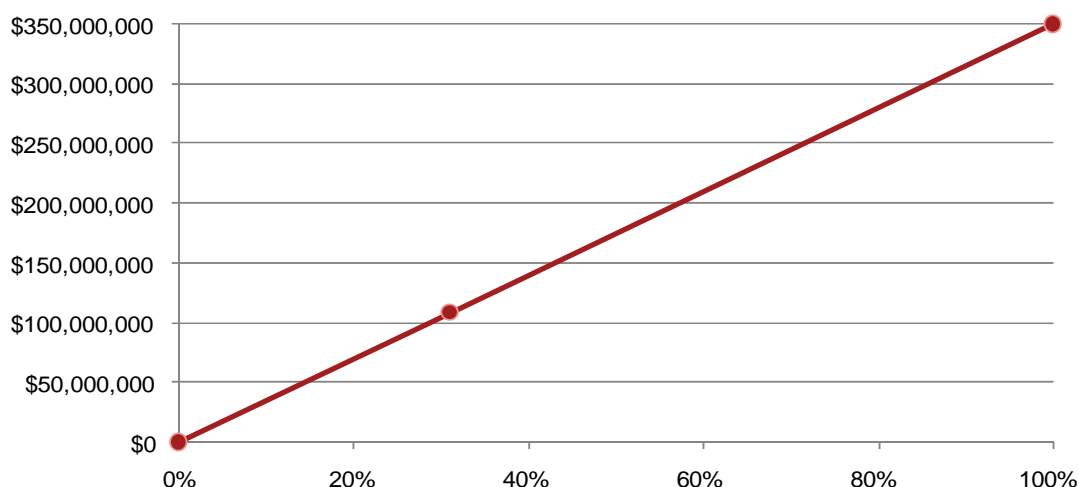
The risk profile of the additional scheme participants is currently under review as part of the GHD work but it is possible to calculate the effect of the proposed extension. The total value of financial assurances required of scheme participants – the funds to which EPA has access – is expected to increase from \$109 million to an estimated \$350 million.¹⁴

¹² Pitcher Partners, 'Financial Assurance Internal Audit Report, March 2008.

¹³ Victorian Auditor-General, 'Audit summary of Hazardous Waste Management', Tabled in Parliament 9 June 2010.

¹⁴ \$109 million / 31 per cent. The actual figure may differ if different formulae are used to calculate the size of the financial assurance for each scheme participant.

Recent developments

Figure 2: Pro-rata increase in financial assurance

This also forms the basis for estimating the increased cost to business. The incremental direct cost is estimated at approximately \$9.6 million ($\$350 \text{ million less } \$109 \text{ million} \times 4 \text{ per cent}$). This can be added to the direct costs incurred by those scheme participants are currently obliged to obtain a financial assurance, estimated above to be around \$4.4 million. In other words, the direct costs to scheme participants resulting from an obligation to obtain a financial assurance will increase to approximately \$14 million.

The indirect cost is more difficult to estimate but might have the impact of doubling the total cost.

GHD is also considering the formulae for calculating the size of the financial assurance required by each category of scheme participant. GHD will undertake the following:

- update the costs used to determine financial assurance amounts
- incorporate the costs incurred by EPA in managing environmental clean up
- change the financial assurance amount calculation to more accurately reflect the expected costs based on operational and site characteristics.

The existing calculation methodology for landfills and PIW will be updated to more accurately reflect the expected costs under different site characteristics. They will also be supplemented by calculation methodology for the remaining four scheduled premise types not previously set out in guidelines.

Overall, some of the calculations under the current formulae are expected to lead to under provision for the costs associated with clean up at the prices in today's market. Furthermore, EPA has previously been unable to recover costs related to the management of the process of environmental clean up.

Preliminary discussions with GHD suggest this will result in a higher average financial assurance amount, potentially by as much as a third. Similarly, the total impost on scheme participants – those to whom the obligation has historically applied and those to whom it will apply in the future – could increase from the previously estimated \$350 million to around \$450 million to \$500 million.

Overall, this \$450 odd million is expected to cost the industry \$18 million in direct costs and possibly up to that amount again in indirect costs associated with decreased borrowing capacity.¹⁵

These estimates are important not only to understand the implications of recent EPA policy decisions, but also as a basis for comparing possible alternatives. Later chapters of this report draw on preliminary GHD estimates of potential clean up costs

¹⁵ GHD is also developing an online tool that scheme participants will be able to access in order to calculate their required financial assurance. It will allow them to input relevant characteristics – type and scale of activities, for example – and then observe the commensurate financial assurance amount.

Recent developments

(developed as part of the reform program) to calculate values such as the expected EPA cost exposure and the possible amount that EPA should recover from industry in order to effectively manage that exposure. The impost on business under these options is compared to the current and anticipated impost on business under the existing financial assurance scheme.

3.2 Other changes as part of the licensing reform program more generally

The expected changes to the financial assurance scheme – the proposed extension and the recalculation of the required size – are part of a broader program of regulatory reform by EPA. These reforms will also incorporate a number of other changes to processes and requirements for licence holders. Some of these initiatives will provide EPA with important information about the compliance performance of scheme participants and by implication, its potential cost exposure in the event of insolvency. While the calculation of the required level of a financial assurance has not typically included costs resulting from unlicensed or illegal activity, EPA is also exposed to these costs.

Therefore, effective monitoring and enforcement becomes one mechanism through which EPA can better understand – and possibly manage – any potential clean up costs either under the extended financial assurance scheme or some alternative. Looking forward, information about compliance performance could be incorporated into the contribution that scheme participants make to *ex ante* provision for or *ex post* recovery of clean up costs following insolvency.

3.2.1 *Introducing business financial assurances*

Due to changes in licensing arrangements, the manner in which financial assurances are obtained will also change. Licensed businesses will have the option of obtaining a business assurance that relates to all relevant activities, rather than multiple site specific financial assurances. Essentially the business financial assurance amount will be the same as the aggregate of the previous site based assurances but the consolidation of such assurances may allow for easier administration on the part of both industry and EPA.

This change will also partially increase EPA's access to funds in the case of insolvency. It is currently unclear whether this is likely to materially increase the cost of bank guarantees for industry.

3.2.2 *Annual performance statements*

As part of its monitoring and enforcement activities, EPA will require licence holders to submit annual performance statements (APS), listing the business' performance against prescribed licence conditions. This will also require signoff by the most senior officer in the company. Furthermore, any incidents of non compliance will be reported immediately with an accompanying explanation of how incidents are to be addressed.

All APSs will be reviewed to ensure completeness, with penalties (including two years imprisonment) for providing false or misleading information, or concealing relevant information.¹⁶

3.2.3 *Monitoring programs*

Each licence-holder will be obliged to develop a monitoring programs must be developed by to ensure they – and EPA – can determine licence compliance. To do this, licence holders must use a risk-based approach to determine the level of monitoring required. These monitoring programs will be auditable documents that must be retained on premises for seven years. Documents older than three years may be archived but must be made available to EPA at the premises on request. Licence holders will have until 30 June 2011 to review and implement an appropriate monitoring plan.

¹⁶ [http://epanote2.epa.vic.gov.au/EPA/publications.nsf/2f1c2625731746aa4a256ce90001cbb5/8487bbc672110e42ca2576cb001b1fa9/\\$FILE/1324.pdf](http://epanote2.epa.vic.gov.au/EPA/publications.nsf/2f1c2625731746aa4a256ce90001cbb5/8487bbc672110e42ca2576cb001b1fa9/$FILE/1324.pdf)

4 Expected future environmental clean up costs

Before examining the potential alternatives to financial assurance, it is important to first gain an understanding of EPA's potential annual cost exposure. The remainder of this chapter outlines PwC's approach to estimating EPA's expected annual cost exposure, including the various inputs and assumptions.

This analysis will allow EPA to better understand the following:

- relative strengths and weaknesses of the alternative models under consideration, in terms of their flexibility and the adequacy of funds to which EPA will have access, for example
- potential costs to businesses under the alternative models being evaluated and to compare these costs to the current program
- inform decisions between EPA and relevant stakeholders (eg DTF) as to the level of exposure/incident that a fund controlled by EPA is required to cover and at which level other sources of funding may be required.

While determining clean up costs in the future cannot be determined with complete certainty, modelling of past insolvency rates and potential clean up costs can provide a reasonable expected of what might be expected.

Approach

After receiving cost estimates from GHD, PwC employed a statistical technique known as monte-carlo simulation to determine the range of potential exposure for clean up costs. This technique allows modelling of uncertainty through random sampling across the range of a defined distribution.

The two main variables that drive of the cost exposures are:

- frequency of insolvency among scheme participants
- expected clean up costs for the various categories of scheme participants.

The key steps involved in performing the modelling included:

- identifying rates of insolvency based on the available sources – i) observed rates of insolvency among EPA licensed entities and ii) more general rates of insolvency, based on ASIC information
- identifying the number of single and corporate license
- obtaining cost estimates for each site to be covered under the scheme (provided by GHD, as part of its current project to reform the financial assurance scheme, and subsequently reviewed by EPA employees) identifying specific cost items that remain uncertain and then establishing feasible ranges of uncertainty for these elements within the cost estimates
- fitting distributions to the cost estimates to develop a profile of potential costs for clean ups across each scheduled premise type (and corporate licence)
- using a modelling software package, @Risk 5.5, to:
 - combine the likelihood and cost curves
 - perform monte carlo analysis
 - identify the long term average annual loss curves for the scheme, which represent what the potential exposure to EPA could look like in any given year.

Limitations of the data

There is a tendency to view the outputs of a quantitative model with a high degree of confidence due to the perceived complexity and rigour of the analytical method. The most reliable quantitative analyses are based on supported empirical data representing a large, relevant sample size.

However, there are obvious limitations in the analysis, associated with both of the key variables that drive the output: insolvency rates and estimated clean up costs.

Insolvency rates used in the analysis are not based on a large amount of historical data relating specifically to the sites or businesses to be covered under the scheme; as noted above, there have been four insolvencies among EPA licensed entities in the past 10 years. Rates of insolvency are, however, a key driver of outcomes – in terms of expected annual cost exposure – so

Expected future environmental clean up costs

improved understanding of potential insolvency rates among scheme participants would dramatically increase confidence in the results.

The cost estimates used within the analysis are in the formative stages of development; they are based on preliminary estimates containing a considerable degree of subjectivity, a range of assumptions, dynamic variables and old information. At this point in time, the analysis provides a view as to what the potential exposures may be, although additional effort on the underlying data and additional site specific information is required before any results can be viewed with a high degree of confidence.¹⁷

Given these substantial limitations, PwC recommends further refinement and updating of the analysis before decisions relating to reserve levels or other cost based decisions are made. It is expected that improvements can be made to the analysis once further progress is made on the current activity being performed by EPA and GHD to develop financial assurance costs based on site specific details provided by industry.

Furthermore, the dynamic nature of the data supporting the analysis means that the analysis would most likely need to be updated on an annual basis at least.

Key assumptions

In order to analyse the data provided for meaningful and relevant results, a number of key assumptions relating to the underlying data, or method of analysis were made. These key assumptions, which influence the way in which the data can be interpreted or used, include:

- Clean-up costs will occur when a scheme participant becomes insolvent
- Costs for a clean up occur within the year of the insolvency occurring (although EPA has historically incurred clean up costs over a number of years following a single insolvency)
- Businesses that become insolvent are in breach of licence and therefore significant clean up costs are required
- All businesses considered in the analysis have the same likelihood of insolvency, including large multinational corporations and local government entities
- Where a business with a corporate licence becomes insolvent, clean up costs are incurred across all sites covered by the business' corporate licence
- The cost of groundwater and soil clean up has considerably greater uncertainty than other cost elements
- Distribution curves based on sample datasets are representative of the typical profile for scheduled premises of that type
- Events are not correlated – for example, there is no allowance for an increase in insolvencies during times of recession or at the bottom of the business cycle. In this instance, the long term average rate of insolvency has been applied.

Key findings

Outputs from the analysis are presented for two scenarios based on different insolvency rates:

- **Scenario 1:** Insolvency rate based on EPA historical information over the past 10 years (0.174 per cent)
- **Scenario 2:** Insolvency rate based on data available from ASIC based on the past 11 years (0.055 per cent).

Of these scenarios, the rate based on EPA's historical information captured over the last ten years is considered more relevant as it more closely relates to the purpose of the analysis, ie it specifically relates to EPA licensed entities.

The key outputs of the analysis are summarised in the graphic and corresponding data table below. These outputs represent the expected long term average annual loss; ie what the cost for any given year may be the cost of a clean up arising from an insolvency. The green curve represents Scenario 1, while the blue curve represents Scenario 2.

¹⁷ GHD's ongoing work with EPA will provide further information on likely clean up costs.

Expected future environmental clean up costs

Figure 3: Distribution of potential costs under different insolvency scenarios

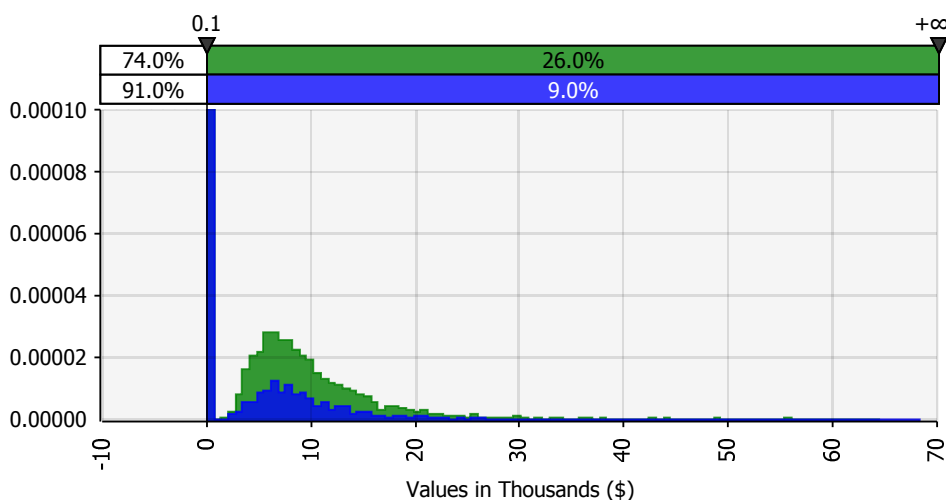


Table 3: Probability and associated cost estimates

Measure	Scenario 1 Insolvency based on EPA historical rate	Scenario 2 Insolvency based on ASIC rate
Max	\$90.4m	\$74.4m
P99.9 ¹⁸	\$51.5m	\$32.5m
P99	\$25.6m	\$14.8m
P95	\$13.8m	\$7.9m
P90	\$10.1m	\$0
P85	\$8.0m	\$0
P80	\$6.2m	\$0
P75	\$3.4m	\$0
P70	\$0	\$0
Mean	\$2.7m	\$0.9m
Confidence limit at the mean	74.5%	91.2%
Percentage of times a zero result is returned (ie there is no insolvency)	74%	91%

The results of the analysis – which are important inputs to the detailed analysis of the shortlisted options contained in the later chapters of this report – demonstrate that:

- Under Scenario 1, it is expected that insolvency among scheme participants will only occur in three out of ten years; under Scenario 2, insolvency among scheme participants will only occur in one in ten years

¹⁸ Pxx = probability that the corresponding value will not be exceeded in any given year. For example, the P90 for scenario 1 suggests that, according to the model, there is 90% confidence that the cost of clean-up in any given year will be less than \$10.1m.

Expected future environmental clean up costs

- A pool of funds greater than \$10 million would be required under Scenario 1 to provide EPA with 90 per cent confidence of having a pool of funds that provides sufficient coverage in any given year
- The average cost per year is \$2.7 million for Scenario 1 and is considerably higher than the average cost experienced by EPA over the past ten years (\$0.8 million) and indeed, under Scenario 2. This may be due to:
 - limitations in the cost estimates that formed the basis of the analysis – particularly in relation to the hypothetical nature of the estimate and the potential for considerable variance between estimated and actual costs
 - the absence of a large clean up event (eg greater than \$10 million) in the last ten years.

The mean value can be thought of as the amount that is needed to be collected each year to break even across the life of a period. It is the sum of all the losses averaged out over the time scale and therefore includes years where there are no clean-up costs. For example, under Scenario 1, the average cost of clean-up over an extended period of time is expected to be \$2.7 million a year. There is a very low likelihood (approximately 2 per cent) that *if an insolvency* occurs, clean-up costs in any given year will be less than the mean for scenario 1.

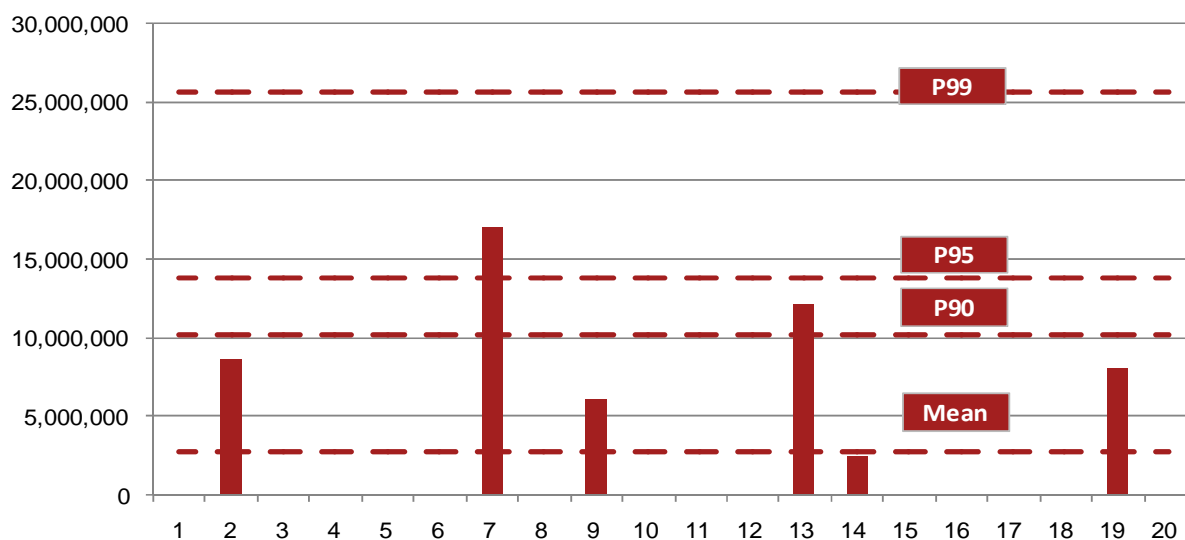
The difference between the two scenarios illustrates that the likelihood of insolvency is a key driver of variability within the model. As mentioned, neither of the two insolvency rates used in this analysis is based on reliable information – improving the accuracy of this information would considerably enhance the reliability of the outputs from the model.

Relevance to the models being evaluated

The analysis was performed in a manner which enables the outputs to be evaluated for each of the different options, with the relevance and meaning of the outputs differing according to the model being evaluated.

The outputs of the analysis can also be presented to demonstrate what the clean up costs could reasonably look like over a period of time based on the outputs of the model. For example, the chart below demonstrates what a 20 year period could look like for Scenario 1. This chart is indicative only, but is particularly useful when considering the practicality of administering and managing a scheme.

Figure 4: Indicative example of potential costs over 20 year period



The frequency and size of incidents of insolvency has implications for the administration of each alternative to the current financial assurance scheme. Under a pooled funding model, for example, EPA would need to consider the necessary annual provision and over what period a fund should be accumulated. Furthermore, it would need to consider scenarios – however infrequent – where the expected outlay exceeds the amount available through a pooled fund and how that shortfall could be addressed. One option might be an advance from consolidated revenue and subsequent recovery from industry.

Similarly, EPA would also need to decide the level of insurance it would seek from an insurance provider under that option.

These issues – and suggestions about how they might be addressed – are considered in more detail in later chapters, which consider the relative merits of the three shortlisted options – pool of funds, recovery after an incident, and insurance.

5 Consideration of alternative mechanisms

There are numerous mechanisms that EPA could use to ensure that the costs of environmental clean up could be recovered.

As part of the first phase of the project, PwC considered a broad range of options to better manage EPA's exposure to the cost of environmental clean up. For ease of assessment these options were grouped in terms of:

- the party that contributes funds
- the point that payment is made.

This can be considered in terms of the following matrix of potential options.

	In Advance	In Arrears
Responsible party	Financial assurance or Individual Insurance	N/A
Industry	EPA Insurance or Pool of funds	Recovery of emerging costs

While there are many possible options, and many more variations and combinations of sub options, some options were not considered to be feasible in this context.

The following list of options was considered to be of sufficient possibility to be considered as part of the high level assessment:

- **Option 1: An industry pool of funds** – whereby scheme participants would be required to contribute specified levy amounts in order to build up and replenish a pool of funds that would be used to fund costs of environmental clean up.
- **Option 2: Recovery of emerging costs from industry** – whereby scheme participants would be required to contribute amounts calculated based on their level of risk and activity in order for the EPA to recovery costs from the previous year.
- **Option 3: An industry insurance scheme** – whereby scheme participants would be required to take out insurance with an existing or yet to be created statutory authority or under contract with a single private insurer in order to provide insurance cover for any environmental clean up costs in the instance of insolvency.
- **Option 4: An EPA insurance policy** – whereby an EPA insurance policy would be taken out by EPA to insure EPA against the cost of clean up. The cost of which would then be recovered from industry.
- **Option 5: An industry pool of funds and EPA insurance for catastrophic events** – whereby a pool of funds would be used in all but catastrophic events, which would be covered via an insurance policy.
- **Option 6: Financial assurance and an industry pool** – whereby the current financial assurance scheme would be maintained, with the addition of an industry pool of funds to cover for instances where financial assurance was not sufficient.

Other options not considered to be feasible alternatives included:

- provision by a regulatory or government agency in advance
- costs are funded through a direct appropriation from government (in light of the policy preference for industry to make some contribution to clean up costs).

Consideration of alternative mechanisms

While these other options do not fall within the scope of this project, PwC believe that these options would likely be scenarios against which any alternative would be assessed as part of any future impact assessment (ie business impact assessment or regulatory impact statement).

The six options list for assessment above were assessed at a high level against the following assessment criteria.

Table 4: Assessment criteria used in high level assessment

Assessment criteria	Description
Industry provides adequate funds	Whether adequate funds are recovered from industry to fund EPA clean up.
Minimum necessary cost for industry	Cost for industry will comprise: <ul style="list-style-type: none"> • direct costs – associated with the scheme • indirect costs – represented by the opportunity cost of restricting borrowing capacity associated with using assets as security.
Equitable (enforced consistently, fairly and transparently)	To what degree of scheme would be enforced consistently across all businesses currently required to obtain a financial assurance, whether costs are imposed on individual businesses in a fair manner, and whether the scheme is transparent for industry.
Ease of administration (enforceable and low cost)	The ease of scheme administration for EPA. This will consider the enforceability of the scheme, as well as the cost of administration.
Ease of implementation	The ease of scheme implementation for EPA. This will consider the required level of effort to implement a new scheme including any requirement to change legislation.

Other assessment criteria were initially considered, but excluded as they did not appear to provide any relative differentiation between options. For instance, the criterion 'avoids perverse incentives' was considered to be equally scored across all options. It is considered that perverse incentives might be present as EPA will clean up waste; irrelevant of the party ultimately charged to fund the clean up, and hence relatively indifferent between options.

At the completion of the high level assessment, it was concluded in consultation with EPA that an industry pool of funds, recovery of emerging costs from industry and EPA insurance policy would be considered in more detail.

These options are discussed and assessed in detail in the following sections. In practice, each of them involves potential tradeoffs in terms of the adequacy of funds they would provide access to and the expected impost of scheme participants. It is possible to design a scheme that effectively removes EPA's cost exposure but the cost to industry would likely be prohibitive.

As such, the options analysis discusses the relative merits of the shortlisted options and clearly identifies those areas where EPA has some flexibility in design. The precise form of the option will ultimately depend on EPA's policy preferences.

Finally, any move away from the current financial assurance scheme needs to be considered in light of EPA's preference for polluters to directly contribute to environmental clean up. Under the current scheme, scheme participants do not contribute to the recovery of costs generated by other scheme participants but this comes at great cost as the total amount tied up in financial assurances is equivalent to some estimation of the costs EPA would incur if every participant were to become insolvent.

A related issue of any move away from the current scheme is that of moral hazard. In this context, a pooled approach can potentially have a distorting influence on the market and the incentives of scheme participants to comply with their licence conditions; they know that they will not be directly exposed to the cost of environmental clean up in the event of their insolvency and their contribution, while solvent, is relatively small.

In practice, PwC does not expect this to be a strong driver of scheme participants' behaviour. Rather, their compliance with licence conditions and regulations will be driven by factors such as EPA's regulatory administration and penalty regime, the participant's concern for its reputation with respect to environmental outcomes.

Therefore, EPA's approach should incorporate two elements:

- effective monitoring and enforcement of licence conditions and development of an appropriate and proportionate penalty regime.
- exhaustive pursuit of assets of companies in liquidation to honour liabilities prior to pursuing funds through some other mechanism (a pool of funds or insurance policy, for example).

6 Option 1: Industry pool of funds

Under this option, the cost of environmental clean up is funded via *ex ante* contributions from scheme participants to an administered pool of funds to which EPA has access under prescribed conditions. All scheme participants would be required to make annual contributions to the pool, potentially in line with some formula that takes account of factors such as the nature of the activity they undertake or their compliance record.

EPA would be able to draw on funds in instances of insolvency among any of the scheme participants and where the costs cannot be recovered from the entity. Scheme participants would contribute to the pooled fund knowing that it can be drawn on to fund clean up costs generated by other entities.

Conceptually, this option is relatively straightforward and the pooling of risk means the total contribution from industry is likely to be lower than under many other options (including the current and proposed financial assurance schemes). However, EPA would need to reach a view on a number of practical issues prior to implementation. They are as follows:

- adequacy of funds
- size of fund
- initial growth of pool
- calculation of individual contributions
- governance
- funds management and investment
- transition considerations
- required complementary activities.

6.1.1 Adequacy of funds

A pool of funds would provide EPA with access to funds in instances of business insolvency where the costs of environmental clean up cannot be otherwise funded. Depending on rules regarding access, it would be expected to exhibit fewer restrictions when compared to the current financial assurance scheme, which restricts access to the amount relating only to a particular site or activity. Expected rules about access to the pool of funds would specify the following:

- The pool would only seek to cover the difference between total clean up costs and amounts recoverable through other mechanisms (such as insolvency proceedings or actions against individual directors). In most cases, these latter sources will not provide any certainty about the timing and adequacy of funds
- The pool provides a mechanism for recovering clean up costs associated with illegal and unlicensed activity, thereby reducing EPA and the State's exposure. There is no specific provision for such costs under the current financial assurance formulae and they would likely be excluded from insurance arrangements (to the extent they could be disentangled from costs attributable to fully compliant activity)
- EPA could develop access rules allowing it to recover all clean up costs (ie removing its exposure), some proportion of costs (ie reducing its exposure) or to provide it with discretion to respond to each insolvency as it considers appropriate. The latter option would allow EPA to only partially cost recover if it considered full cost recovery for a particular clean up to be inequitable or inappropriate. For instance, if the EPA failed to act as soon as they became aware of a situation, then they may only require that scheme participants contribute to half of the incurred cost. In general, the choice regarding the proportion of costs to recover will depend on EPA's views about the appropriate trade off between recovering costs from scheme participants and the compliance burden it considers appropriate.

6.1.2 Size of fund

The size of the fund relates to the funds balance at any point in time. It is intended that the fund would accumulate surplus funds in the initial years so that it can maintain a positive funds balance in the future to pay for all reasonable clean up costs. It is not the intention however that the fund will keep growing indefinitely, and hence there will be a point where the fund moves from an establishment phase into a maintenance phase.

This point will depend on the level of funds that EPA believes will be sufficient to fund expected clean up costs in future years. It is reasonable to expect the pool of funds to be sufficiently large to fund clean up in the vast majority of cases, however it might not be reasonable to build up the fund to such a level that it could pay for all conceivable instances of catastrophic scale clean up.

Option 1: Industry pool of funds

Chapter 5 summarised PwC's modelling of EPA's expected cost exposure and the frequency of insolvencies. Possible options regarding the size of the fund include:

- Only seeking to recover expected annual payouts from scheme participants – around \$2.7 million – in each year, and seeking bridging funds when actual payouts exceed expected payouts
- Building the fund to a level sufficient to generate annual earnings that cover the annual expected payout and then drawing on the fund when actual payouts exceeded expected payouts. At such levels, the value of the fund would only be negative in the event of a highly unlikely and costly insolvency (a one in 100 year event with a cost of around \$26 million, for example)
- Some middle ground between these two options whereby EPA recovers an amount from industry that exceeds the annual expected payout of \$2.7 million and then builds the fund gradually over time. The fund would still be insufficient to recover the cost of less frequent events (those expected to occur once in every 100 or 1,000 years, for example).

Ultimately, the decision about the desired level will come down to a trade off between drawing funds from industry to build up a balance that could fund the maximum percentage of possible clean up costs in future years (in line with EPA's preference for risk) and the increasing burden on industry of building the fund up to such a level. The decision about the size of the fund – and the size of incidents it attempts to recover – also influences EPA's (and potentially the State's) residual exposure.

Irrespective of EPA's compliance and monitoring activity, there is always the potential for extreme or catastrophic unforeseen events, the cost of which could far exceed that predicted by PwC's modelling.

6.1.3 Initial growth of pool

The duration of the initial establishment period of the fund will depend on the target growth rate.

Growth rate

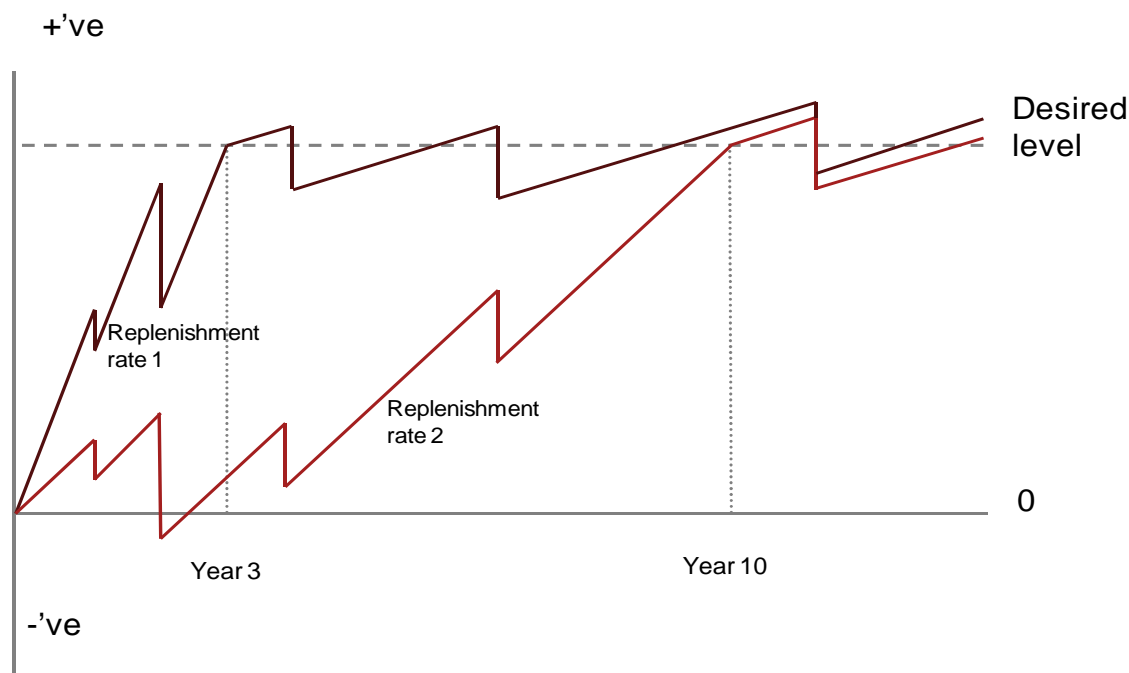
The pool of funds will need to be generated over a period of time (the establishment period). The duration of the establishment period will need to be considered in terms of its impact on both the certainty of reaching the desired level within the expected timeframe and the impact that a high growth rate will have on scheme participants.

For instance, building up funds at a rate that is expected to reach the desired level within three years will provide more certainty but require higher contributions on scheme participants. Building up funds at a lower rate however, will be more influenced by the draw down rate over a longer period and hence provide less certainty. A slower growth rate will also place less pressure on scheme participants as contributions will be less.

It might also be considered that new incumbent businesses should contribute an additional amount in the first year. This would account for the fact that they are of similar (if not greater) risk of becoming insolvent in any particular year, but have not been contributing to the fund in previous years like over scheme participants.

The following diagram demonstrates the difference the growth rate makes to the time required to reach the desired level.

Option 1: Industry pool of funds



This also shows that a lower growth rate is more likely to move towards negative territory due to high cost clean ups in initial years.

Negative balance

EPA will need to consider whether it would allow the fund to go into a negative balance due to large unanticipated clean up costs.

Various options for funding a negative fund balance would include obtaining:

- an advance out of consolidated revenue
- a commercial terms loan
- a government grant (allocation) to top up the fund.

An advance from consolidated revenue would need to be agreed in advance by the Department of Treasury and Finance but would avoid incurring any interest costs.

A commercial terms loan or overdraft would need to be negotiated in advance with a financial institution and would attract interest. Depending on the rules around the use of contributions, the interest expense may also be funded through by scheme participants.

A government grant would be negotiated with the Department of Treasury and Finance and essentially provide a similar outcome to a situation where the EPA decided not to fully recover costs.

If it were decided that the fund would not enter a negative fund balance, EPA would essentially need to fund clean up until a positive balance was once again generated. This increases the exposure to clean up costs for EPA but reduces the burden on industry in the instance of catastrophic events.

Maintenance phase

Once the pool of funds reaches a desired level, only a reduced contribution amount will be provided from scheme participants. This is because the contributions will no longer be required to grow the fund, but rather replenish the fund. Also, the pool of funds will also generate some return on investment at this stage generating some of the revenue needed to balance the funds required for funding clean up. More discussion on the investment of fund is provided below.

Option 1: Industry pool of funds

6.1.4 Calculation of individual contributions

There is a number of ways in which the individual contribution or levy amount for businesses could be determined.

A simple approach would be to require contributions from scheme participants at a fixed and common amount, irrespective of size, potential risk or activity. This would be simple to administer.

A more complex and sophisticated alternative would be to calculate contributions based on characteristics or factors such as the following:

- scheduled premise type
- size or scale of activities
- activity type
- past compliance record (as revealed through PIN and PAN data, and through APS and other monitoring activity).

This would be more akin to the current formula based approach to calculating the financial assurance for scheme participants. Furthermore, GHD's current work to estimate expected costs per site and activity is a possible input to future calculations; as discussed in section 5, GHD is currently undertaken an exercise to create an online tool that collects information on business activity levels, risks and volumes. The work and potentially that platform used to generate this calculation tool in the short term could potentially be used under this option in the longer term to inform yearly contribution amounts.

In any event, the pooling of risk means the total amount required would be less than that demanded by the current financial assurance scheme (and certainly less than under the proposed extension). For example, recovery from industry of the expected annual payout of \$2.7 million would translate into an average contribution of around \$11,000 per scheme participant, compared with around \$61,000 per scheme participant under the current scheme.

6.1.5 Governance

The pooled fund option would need to be supported by appropriate governance and institutional arrangements. This would incorporate decision making with respect to the management and administration of and access to the fund.

A suitable arrangements would be to appoint a board of trustees to report on the operation of the fund to the EPA Board Roles of the board will include the need to make decisions on:

- approving fund draw down applications
- forecasting future costs
- reviewing the fund balance and adjusting levy amounts accordingly each year.

The board could be comprised of individuals – including industry representation – with expertise and experience in the following areas:

- environmental regulation and hazardous waste management
- corporate and project management
- investment appraisal and review
- risk assessment and management.

It is likely that the board would need to report to the EPA Executive Team on the fund balance, revenue from contributions and return on funds, funding draw down amounts, and any significant events.

Information would also need to be prepared to inform the public or stakeholders on the intentions, balance, outcomes and progress of the fund. Specifically, the following type of documents may need to be prepared:

- budget estimates
- annual reports
- promotional material (physical and website forms).

Option 1: Industry pool of funds

6.1.6 Funds management and investment

Monies in the fund would be treated like a trust and responsibly invested by either the EPA or an external body. Potential fund managers other than EPA would include:

- Victorian Funds Management Corporation (VFMC), which manages funds for clients defined as public authorities under the [Victorian Funds Management Corporation Act 1994](#)
- another government body
- private funds manager.

The VFMC generally manage funds of a much larger size than the likely size of the pool of funds considered in this section. It is unclear whether the VFMC would take on the funds management relating to a pool of this size. The associated fees would also be significant in comparison to EPA or another government body.

Victorian Funds Management Corporation

The VFMC was established under the Victorian Funds Management Act 1994 to provide investment and funds management to Victorian public authorities. The VFMC can tailor investment management services using a combination of in-house and external fund management expertise. VFMC managed investments of \$34.7 billion at 30 September 2010 for 14 Victorian public sector and related organisations including entities such as the Victorian Workcover Authority, Metropolitan Fire and Emergency Services Board, National Gallery of Victoria, University of Melbourne and Royal Children's Hospital.

A private funds manager is a further option but like the VFMC would charge an associated fee.

The advantages of using an external funds manager would be their expertise in providing:

- comprehensive investment risk management via optimal portfolio diversification and stringent process control
- a highly skilled investment team with depth in emergent asset classes
- strong economies of scale, delivering lower funds management, administration and custody costs
- access to markets through its substantial buying power.¹⁹

A cheaper option however would be for EPA or another government body to undertake the fund management role. It is likely this could be undertaken at lower cost, however, this is not a core competency of most government bodies and it is assumed that their management might be less effective or efficient.

6.1.7 Transition considerations

Required legislative changes

It is anticipated that legislative change will be required to implement this option in order to allow the EPA to require that current scheme participants contribute a levy amount towards the pool of funds. This will require changes to both the Act and the Subordinate legislation.

Changes to the Act will need to take place in the first instance. Preparation of the Business Impact Assessment, drafting of the Bill etc is a process that usually takes between 6 to 12 months depending of the level of complexity and the urgency of change.

Changes to the Regulation will undergo a similar process and may take around another 4 to 12 months to complete depending on the level of consultation, level of complexity and urgency of the change.

¹⁹ Taken from the VFMC website.

Option 1: Industry pool of funds

Transition from financial assurance scheme

Transition from the financial assurance scheme to a pool of funds will need to be carefully managed to ensure equity for industry participants.

Any financial assurances that relate to existing sites where the business has become insolvency and there is potential for required clean up should be retained

6.1.8 Required complementary activities

As mentioned, the issue of moral hazard would be best addressed through effective monitoring and enforcement and an appropriate penalty regime. Financial assurance is one element of EPA's broader licensing framework and PwC holds the view that effective monitoring and enforcement should be the primary mechanism for encouraging compliant behaviour by solvent entities.

From a theoretical perspective, the EPA should undertake monitoring, enforcement and punishment in the form of enforcement effort and fines up to a level that makes the expected cost to the industry of illegal activity equal to the external costs of the illegal activity. In principle, the enforcement effect should be small due to the resource intensive nature of the activity and the fine amount should be high because they cost a lot less from EPA's perspective. This approach runs some risk that the huge fines could be successfully evaded in the courts, that the legal costs of collecting the fines will be excessive.

Empirical literature on this approach has generally found that tighter enforcement does indeed lead to greater compliance with disposal regulations.²⁰

The optimal level of monitoring is difficult to determine. On one hand, if the EPA inspects almost no one, then self-interested entities will not comply and clean up costs are likely to be very high. On the other hand, if the EPA inspects everyone and frequently, clean up costs are likely to be small but the resources expended on the inspections will be very high.

6.2 Assessment

There is considerable flexibility available to EPA regarding the precise operation of a pooled fund arrangement, most notably with respect to the amount recovered from scheme participants in each year. This will depend on EPA's view with respect to risk – whether it is prepared to accept that it may need to obtain or borrow funds in the small number of years in which costly incidents occur, for example – and the extent to which it is prepared to impose costs on scheme participants.

EPA could choose to build the fund to a level that covers all but the most unexpected events – one in 100 year frequencies, for example. In this case, fund earnings would generally be sufficient to cover the expected annual payout. This would, however, come at considerable cost to industry.

PwC expects that the pooled fund option will outperform many others in terms of the adequacy of funds and the total impost on business, which is largely the result of the pooling of risk. Consultation with the EPA Financial Assurance Working Group also highlighted that they believe that this is an important option for consideration.

As EPA has greater control of the rules of access, this option has the advantage of potentially allowing for the funding of illegal or unlicensed activity, including illegal dumping. PwC does not expect this would be easily incorporated into the insurance option (or if so, at great cost to EPA and hence, to industry).

The ability of a pool of funds to cover the full costs of environmental clean up in any year will depend on the desired level for the pool and the ability for the pool to go into negative and essentially recover negative balances in arrears.

While the long term cost of a pool of funds is expected to be less than the current financial assurance scheme (with full participation), it would likely require that industry pay higher contributions in the initial years in order to build the fund to an appropriate level.

²⁰ R. Porter, The economics of waste, 2002

Option 1: Industry pool of funds

As with the other options, EPA could develop formulae to calculate the individual contributions of each scheme participant. This would not reflect the likelihood of insolvency – EPA does not have prudential oversight capabilities – but rather, the possible costs if that participant became insolvent. Furthermore, the annual contribution in line with some formula creates a clear expectation among scheme participants; it becomes a cost of doing business. This contrasts with recovery in arrears, for example, where scheme participants contribute after an event and to recover costs that they did not generate. Irrespective of the relative size of ex post contributions, the uncertainty and perceived inequity could encounter opposition.

In relation to the other options, this option will also incur costs related to funds management, oversight and administration.

For a \$14 million pool, the cost to industry might be around \$6 million per year over 5 years to establish the fund and \$2 million per annum after that.

Under an scenario where a cap of \$14 million is built up over 5 years, the scheme is likely to cost industry around \$6 million per annum – around \$25,000 on average per scheme participant – while the pool is being established, and around \$2 million per annum – or around \$8,600 on average per scheme participant – after that.

A variation of the pooled approach might be to only seek to recover the expected annual payout of \$2.7 million; an average contribution per licensed entity of around \$11,000 per annum.

Both estimates can be compared with the estimate of the average annual contribution under the current financial assurance scheme of \$61,000.

Overall cost

Overall, a pool of funds is expected to enable for full recovery of cost related to environmental clean up subject to allowing the pool to go into a negative balance.

While the cost of a pool of fund is expected to be slightly more than the recovery in arrears option due to higher administration costs and funds management fees, the cost is expected to be comparable over the long term. In the short term however, the cost for industry to enable to pool to be established could be significantly higher.

7 Option 2: Recovery of emerging costs from industry

Under this option, EPA would seek to recover **actual** clean up costs from scheme participants after the event (ie in arrears). Environmental clean up costs incurred by EPA due to business insolvency would be recovered (either in whole or in part) in the year or years following the cost being incurred.

This means EPA would incur costs in the short term – particularly where an incident requires an immediate response – and then either carry the cost itself or obtain funds from some other party until such time as they can be recovered from scheme participants.

7.1 Issues for EPA consideration

EPA will need to form a view on the following issues:

- adequacy of funds
- bridge funding
- calculation of individual contributions
- governance
- administration
- transition considerations
- required complementary activities.

7.1.1 Adequacy of funds

Recovery in arrears would provide EPA with access to funds in instances of business insolvency where the costs of environmental clean up cannot be otherwise funded.

Like the pool of funds option it would exhibit fewer access restrictions when compared to the current financial assurance scheme that restricts access to the amount relating only to a specific site or activity. Access however, would still need to be governed by clearly defined access rules.

EPA will also need to consider whether it would seek to recover costs generated by illegal or unlicensed activity. If these costs were recovered, licensed business would essentially pay for these costs rather than imposing the cost of the State or by implication the taxpayer. It may, however, encounter some opposition as scheme participants may feel that such costs – assuming they can be identified, quantified and then separated from other costs – might have been prevented through effective regulatory administration.

Like the pool of funds option, EPA would need to form a view of the level of cost recovery it wishes to enforce.

Full cost recovery

A full cost recovery option would mean that no additional funding would be required from EPA or the State and hence EPA's cost exposure would be very small. This option however, would require higher contributions for scheme participants.

In instances where scheme participants feel that the EPA have not acted to most efficiently and effectively regulate the industry, there may be some reluctance to pay for the full costs under this option.

Partial cost recovery

Partial cost recovery would place a lower contribution requirement on scheme participants but would increase EPA's cost exposure. Under this option the EPA would be required to find a way to fund the additional cost not recovered by the pool of funds.

This option would help to avoid the situation where participants have the perception that EPA has not adequately regulated the failed business and try to avoid payment.

Option 2: Recovery of emerging costs from industry

EPA discretion

A more preferable (and potentially, practical) option would be to aim for full cost recovery in most instances but leave EPA with discretion regarding the percentage of cost to recover in any particular circumstance.

This would allow EPA to only partially cost recover if it believed it inappropriate or inequitable to enforce the full cost recovery requirement in relation to a particular clean up. For instance, if the EPA failed to act as soon as it became aware of a situation, then they may only require that scheme participants contribute to half of the incurred cost.

Yearly maximum cap in recovery

EPA data on environmental clean up costs incurred over the last 10 years shows that while it is unlikely that costs related to a single clean up will all be incurred in a single year; rather, the overall cost of clean up from year to year fluctuates significantly.

Under an unrestricted recovery scheme the EPA will essentially have an unlimited call on business funds, fluctuating costs will mean the potential for large total recovery amounts in some years. This may cause significant uncertainty for business planning and cash flow planning.

EPA should consider whether requiring full recovery of large amounts in one year is desirable or whether capping the yearly recovery amount – but then recovering amounts relating back to the previous incident in later years – might be preferable.

For example, it might be decided to cap the recovery from scheme participants at \$5 million in any one year. Over the previous 10 years, this would have meant that in 2005-06 that only \$5 million would have been recovered in that year rather than the full cost incurred of \$5.7 million.

It is possible that scheme participants would not make any contribution in some years, depending on the rate of insolvency among licensees and the extent to which costs are mitigated through monitoring and licensing activities

Recovery of amounts over cap in later years

If a yearly cap is used, it is also important to determine whether remaining amounts will be recovered in subsequent years. If it is decided to recover remaining amounts in subsequent years, the remaining \$0.7 million in the previous example would be recovered in 2006-07.

In the instance where remaining amounts are not recovered however, EPA would bear the remaining cost over and above the cap in any particular year.

Table 5 and Table 6 below are illustrative but demonstrate the implications of each option. Under the cap and recover later option in Table 5, the full amount is recovered at the end of the three year period.

Table 5: Cap and recover later example

	Year 1	Year 2	Year 3	Total
Cost	\$7m	\$4m	-	\$11m
Amount recovered	\$5m	\$5m	\$1m	\$11m
Amount carried over	\$2m	\$1m	-	-

In the cap and forgo example in Table 6, \$2 million in year 1 is never recovered as the total cost in that year exceeded the \$5 million cap and no later recovery is allowed for.

Table 6: Cap and forgo recovery example

	Year 1	Year 2	Year 3	Total
Cost	\$7m	\$4m	-	\$11m
Amount recovered	\$5m	\$4m	-	\$9m
Amount carried over	-	-	-	-

Option 2: Recovery of emerging costs from industry

7.1.2 Bridge funding

Recovery of costs in arrears necessarily presents some timing issues that will need to be resolved. As funds are only recovered in the year or years following the incident, a bridge funding mechanism becomes necessary. This will essentially pay for the cost of clean up until such a time in the following year that the full costs are recovered from scheme participants.

The likely supplier for these funds would be the Department of Treasury and Finance (DTF). It is unclear at this stage whether DTF would be willing to provide such funds, likely to the form of a Treasury advance. Alternatively, EPA might be able to fund cost in the short term when costs of clean up in any particular year remain low.

Without an arrangement for bridging funds to be provided however, this option becomes unachievable.

7.1.3 Calculation of individual contributions

As discussed in the previous section, there are a number of ways in which the individual contribution or levy amount for businesses could be determined.

Contributions may be required of business at a fixed rate, irrelevant of their size, potential risk or activity. This however, might be seen as unfairly burdening smaller or less risky activities.

A more equitable solution would see levy amount calculated for each individual business based on a number of characteristics, potentially including:

- level of risk
- past level of compliance
- size
- activities
- scheduled premise type.

As previously discussed, this information could primarily be informed by the work currently being undertaken by GHD. As discussed in Chapter 5, GHD is currently undertaking an exercise to create an online tool that collects information on business activity levels, risks and volumes. The work and potentially that platform used to generate this calculation tool in the short term, could potentially be used under this option in the longer term to inform yearly contribution amounts.

7.1.4 Governance

Governance arrangements are likely to be prescribed in legislation and subordinate instruments and would include various directions on decision making and review powers. A likely arrangement might be where EPA sub-committee are set up to report to the Chair of the EPA board and recommend decisions on recovery of environmental clean up costs, depending on the individual circumstances of each event.

Like the board of trustees discussed for the pool of funds option, the role of the committee would include the need to make decisions on:

- approving fund draw down applications
- forecasting future costs
- reviewing the fund balance and adjusting levy amounts accordingly each year.

It is likely that the board would need to report to the EPA Executive Team on the nature and amount of clean up expenditure and likely future cost related to known clean up activity.

Information would also need to be prepared to inform the public or stakeholders on the progress and outcomes of the scheme. Specifically, the following type of documents may need to be prepared:

- budget estimates
- annual reports
- promotional material (physical and website forms).

Option 2: Recovery of emerging costs from industry

7.1.5 Administration

Administration of the scheme would likely be undertaken by the EPA. The EPA currently undertakes cost recovery for their normal regulatory function via the provision of fees for regulated entities.

The documentation requirements to administer the scheme would include:

- schedule of environmental clean up cost payments (signed by relevant EPA staff)
- appropriate tax invoices
- financial reports of all expenses incurred
- approval of cost recovery.

This assumes that accurate records are kept, and this would require that EPA increase the accuracy of record keeping in the future.

7.1.6 Transition considerations

Required legislative changes

Like the pool of funds option, it is anticipated that legislative change will be required in order to implement this option in order to allow the EPA to recover costs of environmental clean up from current scheme participants.

Legislative amendments and new regulations or subordinate instruments would necessitate the preparation of a Business Impact Assessment or Regulatory Impact Statement and would usually take between 4 to 9 months to complete depending on the level of consultation, level of complexity and urgency of the change.

Transition from financial assurance scheme

Transition from the financial assurance scheme to a pool of funds will need to be carefully managed to ensure equity for industry participants.

Any financial assurances that relate to existing sites where the business has become insolvency and there is potential for required clean up should be retained

7.1.7 Required complementary activities

Like the other options, recovery of environmental clean up costs in arrears would require that EPA ensure effective monitoring and enforcement, and an appropriate penalty regime. The emphasis with this option would be monitoring and prevention, potentially more so given the possibility that scheme participants might hold the view that some or all costs could have been avoided through effective regulatory administration.

See the discussion of complementary activities in section 7 for more details.

7.2 Assessment

This option is not a significant departure from EPA's recover of costs associated with regulatory administration. For example, EPA prescribes regulated fees in order to recover the costs it incurs for activities such as works approvals, licences, septic tank permits and prescribed waste transport permits.

The recovery of costs under a recovery in arrears option will depend on the imposition of a cap, the amount of such a cap and a decision around the recovery in future years should amounts exceed that cap. Recovery in arrears would not have the same limitations in terms of illegal or unlicensed activities that might be associated with option like insurance.

This option will afford EPA control over the scheme and can be designed in such a way (with or without a cap) to recover all costs related to environmental clean up.

Option 2: Recovery of emerging costs from industry

Overall however, this option will afford EPA control over the scheme and can be designed in such a way (with or without a cap) to recover all costs related to environmental clean up.

This option is likely to impose the least cost on industry and government as no money is put aside in advance; business is only obliged to contribute to actual costs incurred (within the cap for any one year), administration costs are expected to be lower than a pool of funds and reporting costs lower than an insurance option. PwC's modelling of the frequency of insolvencies and the commensurate costs indicates the possible contribution by scheme participants over the longer term \$2.7 million or \$11,000 on average per scheme participant. However, there will be considerable variation in the annual contribution, which may create some problems, particularly for smaller scheme participants.

The likely variability in contributions from one year to the next may also be problematic for some businesses, and hence impose costs on them related to this uncertainty. It is not expected however that this additional cost would outweigh the benefits of an otherwise low cost option.

This option would not generate funds management costs that would be incurred under a pool of funds and no external profits would be made by funds managers or insurance providers.

Recovery in arrears is likely to cost industry around \$3 million per annum based on analysis.

Like the pool of funds, this option would see the EPA (the State) take on the additional risk or exposure at no cost to scheme participants (unlike the insurance option that will require that an insurer take on the additional risk and scheme participants bare the cost)

A benefit of recovering in arrears over a pool of funds would be the absence of a requirement for high contributions in the initial growth phase like a pool of funds.

Other considerations

Two potential disadvantages to this option are:

- no contribution by responsible parties
- reliance on bridge funding.

Two potential disadvantages to this option are no contribution by responsible parties and reliance on bridge funding.

This option would not enable the requirement of any contribution by the responsible party in advance. Some scheme participants may view this as inequitable.

This option is also reliant on adequate bridge funding. This is likely to be provided by DTF, and hence the feasibility of this option would need to be discussed with DTF at a later stage to identify willingness to provide such funds.

Summary

This option represents the lowest cost option and effectively recovers the costs of environmental clean up. This needs to be weighted up against the fact that this option will require bridge funding, places less of a yearly payment expectation and may impose fluctuating cost on industry.

8 Option 3: An EPA insurance policy

The third option for detailed analysis is a scheme that would seek to provide funds to EPA via an insurance policy.

As with the pooled fund option, this option pools the risks across all scheme participants and in principal, could result in a lower annual contribution per scheme participant than the current financial assurance model. It would both insure the government against the cost of clean up and also provide EPA with a mechanism by which to recover the cost of obtaining that insurance. As with other options, EPA could develop formulae to calculate the respective contributions of each category of scheme participant, taking account of factors such as the size, scale and type of activity they undertake, and their compliance record. At the same time, funds management is outsourced to a third party who has greater experience with the management of risk.

Unlike the previous options considered, by which the government self insure against the variable cost, this would shift the risk from government to a private insurer (albeit at what is expected to be a significant cost – discussed in the next sections).²¹

Market availability

A key factor in implementing this option would be identification of a suitable insurance provider. The market for specific environmental insurance in Australia is quite thin and there are few specific environmental products; organisations tend to address any exposure to environmental liabilities through public liability insurance.

Where such products do exist, they typically cover situations where the base case – in terms of current pollution or contamination levels, for example – can be clearly identified and measured and the incremental harm that occurs over the life of the policy is evident.

In this context, this would mean identifying pollution and contamination levels at all licensed sites across Victoria in an attempt to quantify the base case and then developing processes to monitor the incremental contribution to pollution and/or contamination (or anything that generates post insolvency costs) following the commencement of the policy.

Consultation with a prominent Australian insurer suggests there will be few, if any, insurance companies in either Australian or in other countries willing to enter into negotiations with an organisation such as EPA to develop a highly specific and tailored environmental insurance product.

Finally, any policy would be likely to contain clearly defined exclusions, such as costs generated by illegal or unlicensed activities that might have been avoided through more effective monitoring and enforcement activities (assuming those costs could be disentangled from costs generated by compliant activity).

Assuming a policy could be negotiated; insurers would be expected to examine how best they could avoid making a payout in the event of insolvency. This would likely involve a forensic examination of the costs incurred to determine how they might have been avoided.

Over the course of the policy, an insurer would also likely require a detailed examination of EPA's activities, in terms of its monitoring and enforcement activity in relation to licensed sites.

This is likely to require reporting, auditing and analysis of strategies and the resourcing of regulatory activities for example, to satisfy the insurer that EPA is undertaking its roles appropriately to minimise the costs of clean up, adequate staff levels are maintained, monitoring records are kept up to date, and compliance is followed up on regularly, etc.

²¹ The shortlisting process identified practical barriers to options such as mandatory insurance held by scheme participants, either with a provider of their choice or a specifically created statutory entity.

Option 3: An EPA insurance policy

8.1 Issues for EPA consideration

PwC expects these challenges are not insurmountable but that a policy could be negotiated, albeit at a high cost and with highly restrictive conditions and oversight (certainly relative to the pooled fund option). In practice, EPA would need to form a view on the following issues:

- provider type
- adequacy of funds
- calculation of individual contributions
- transition considerations
- required complementary activities.

8.1.1 Provider type

It is theoretically possible for this type of insurance product to be provided by either the private insurance market or a new Government Authority.

Provided by a Government Authority – a new or existing government authority could provide insurance cover, much like WorkSafe or the Traffic Accident Commission.²² In this instance the government would underwrite the insurance and hence it is comparable to a pool of funds. The costs of establishing such an authority or of an existing authority absorbing an additional function are likely to be prohibitive.

Provided by the private market – environmental type insurances are occasionally provided by the private market but a customised product such as that required in this context, would be very expensive. This is primarily due to the uncertainty of payouts, the various contributing factors to payouts (such as the effectiveness of EPA's monitoring and enforcement activities) and the inability for insurance companies to adequately gauge and manage that uncertainty.

8.1.2 Adequacy of funds

It is unlikely that insurance cover would be provided for incidents relating to illegal or unlicensed activity; the expectation on the part of an insurer would likely be that costs generated by illegal or unlicensed activity should be minimised or avoided through effective monitoring and enforcement. If it was offered by an insurance provider, the additional cost to include these components in the scope of cost is expected to have significant impacts on the price of such cover.

EPA has advised that every incident of insolvency over the past ten years has involved at least some illegal or unlicensed activity. This appears to be due to the incentive for businesses that are struggling financially to cut costs by undertaking activities against the terms of their licence. For example, a business may have incentives to stockpile PIW rather than pay to dispose of it.

Insurance cover that does not cover incidents of illegal or unlicensed activity is therefore very restrictive. While it is theoretically possible to obtain insurance that would cover this type of activity at a much higher price, it is unlikely that this would be offered by the market.

EPA could manage these issues through a range of mechanisms, each of which serve to increase its cost exposure:

- only seeking to recover some proportion of costs
- only seeking to recover costs that exceed a specified threshold
- agreeing to pay an excess in the event of insolvencies that generate clean up costs.

²² The amount recovered every year in this case is not on the same scale as that of WorkSafe or the Traffic Accident Commission (TAC) and the establishment and administrative costs are likely to far outweigh the expected costs of clean up.

Option 3: An EPA insurance policy

8.1.3 Calculation of individual contributions

As discussed in the previous sections, there are a number of ways in which the costs recovered (in line with DTF cost recovery guidelines) could be charged in fees.

Fees may be required of business at a fixed rate, irrelevant of their size, potential risk or activity. This however might be seen as unfairly burdening smaller or less risky activities.

A more equitable solution might be to calculate fees each individual business based on a number of characteristics, potentially including:

- level of risk
- past level of compliance
- size
- activities
- scheduled premise type.²³

The premiums incurred by EPA could be recovered from industry in accordance with the cost recovery guidelines.

8.1.4 Transition considerations

Required legislative changes

Like the recovery of costs in arrears (option 2), it is anticipated that legislative change would be necessary to implement this option to allow EPA to recover costs of environmental clean up from current scheme participants. This will require changes to the Act and the supporting subordinate instruments. Such amendments would require preparation of a Regulatory Impact Statement and would usually take between 4 to 9 months to complete depending on the level of consultation, level of complexity and urgency of the change.

Transition from financial assurance scheme

Like the other options, recovery of environmental clean up costs in arrears would require that EPA ensure effective monitoring and enforcement and an appropriate penalty regime. The emphasis with this option would be monitoring and prevention.

8.2 Assessment

PwC expects the option of obtaining insurance for incidents of unlicensed or illegal activity would be cost prohibitive and highly inflexible for EPA, which ultimately increases EPA's cost exposure.

This option would take much of the control over the funding away from the EPA and place reliance on the insurance provider. This may lead to instances where lodged claims are unsuccessful or delayed, with scope limitations are out of the control of EPA.

In order to determine the market cost of an insurance policy that would cover the EPA for the costs of environmental clean up, the EPA would need to provide a detailed assessment of all the past costs, current licensed sites and characteristics, past compliance history and intended compliance and monitoring activity.

As a general rule, the less information that is able to be provided to the potential insurance provider, the more uncertainty and hence risk they face. The greater the level of risk for the insurer, the less likely they are to provide the insurance and the higher the likely cost of the insurance policy should it be provided.

²³ This information could primarily be informed by the work currently being undertaken by GHD. As discussed in section 5, GHD are currently undertaken an exercise to create an online tool that collects information on business activity levels, risks and volumes. The work and potentially that platform used to generate this calculation tool in the short-term could potentially be used under this option in the longer term to inform yearly fee amounts.

Option 3: An EPA insurance policy

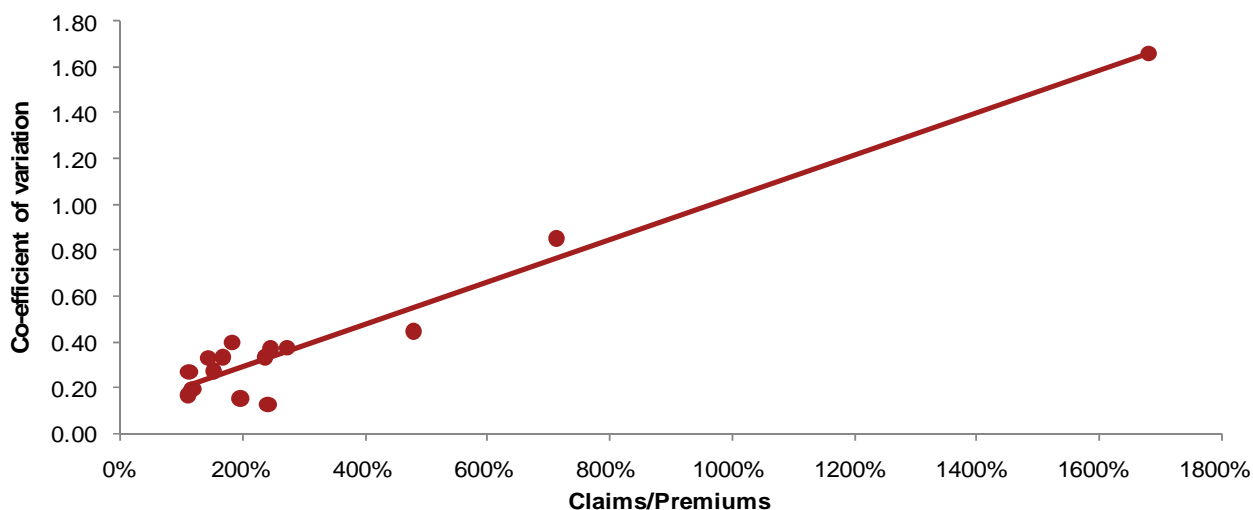
While a full quote from insurance providers is not desired at this stage, some high level estimates can be made based general insurance data from the Australian Prudential Regulation Authority (APRA), the following higher risk types of insurance are listed in Table 7 to give an indication of the average gross premium to claim ratio.

Table 7: Selected insurance policy average gross premium to claim ratio

	2005	2006	2007	2008	2009	2010	Average
Fire and ISR	232%	213%	188%	92%	156%	218%	183%
Consumer credit	505%	430%	672%	527%	428%	307%	478%
Public and product liability	169%	235%	464%	262%	159%	188%	246%
Professional indemnity	164%	185%	208%	197%	109%	137%	167%

It is unclear however, what premium to claim ratio might be applicable to an EPA insurance policy. Therefore, PwC has analysed the claim to premium ratio in relation to the coefficient of variation of yearly claims. This shows that there is about a 0.7 R squared correlation. Extrapolated out, it suggests that based on the coefficient of variation figure for EPA related environmental clean up costs of 0.7, the likely claim to premium ratio would be around 1700 per cent. This analysis is shown in Figure 5 below.

Figure 5: Analysis of relationship between co-efficient of variation and claim:premium ratio



With average expected claims of \$2.7 million, this analysis suggests an insurance premium cost of around \$45 million per annum, around double the cost of any other alternative considered in this report. This translates into an average contribution per scheme participant of around \$184,000 per annum.

Analysis suggests an insurance premium of around \$45 million pa.

While taking out an insurance policy would reduce EPA costs associated with administration of a scheme (as most of the administration and governance is undertaken by the insurer), it is expected to be offset by the additional cost required to manage the insurance contract – both at its commencement and during its life – and to ensure adequate reporting to the insurance provider.

Summary

While this option might have some intuitive appeal in terms of allowing for administration by insurance specialists, the analysis shows that the potential cost of around \$45 million far exceeds that generated under other options. Similarly, the onerous nature of reporting by EPA to the insurance provider and difficulties in initial negotiations are likely to be further obstacles.

9 Preferred option and next steps

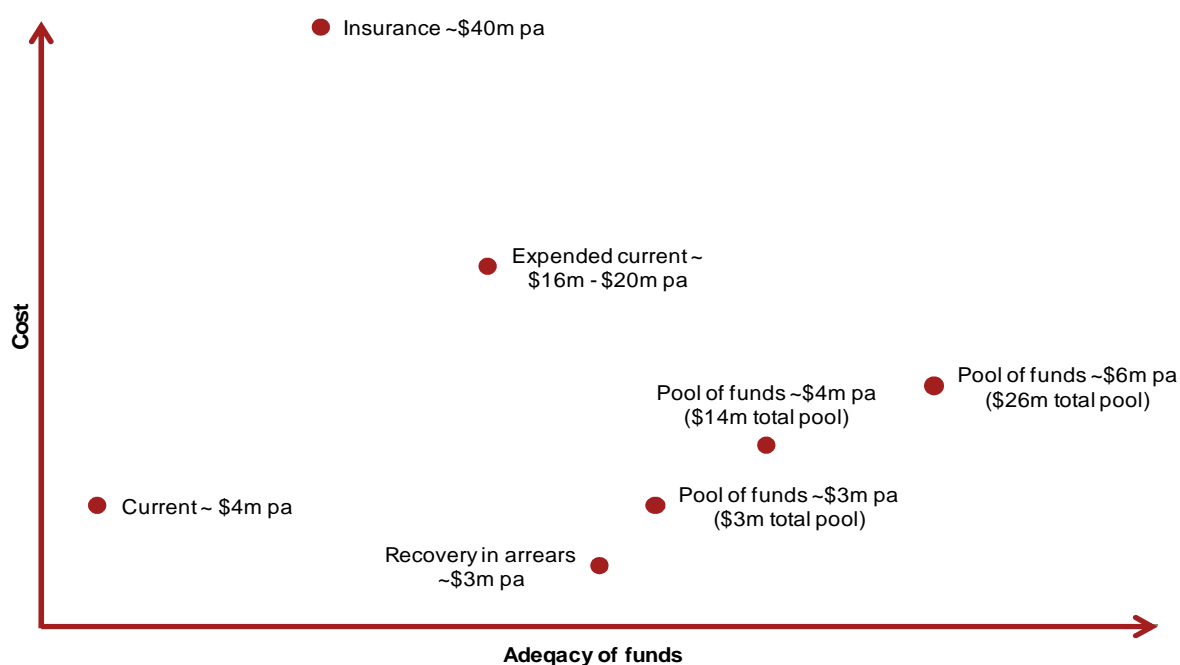
From the analysis undertaken in relation to the cost of each option and the likely ability of each option to adequately recover the cost of environmental clean up, the insurance option is the least preferred.

Analysis of the insurance option suggests it is likely to be significantly higher in cost and also have associated limitations in terms of:

- EPA control of the scheme
- the ability to recover the costs of clean up that are related to illegal or unlicensed activity.

Figure 6 shows the expected relationship between the cost and adequacy of funds under each of the options, as well as the current and expanded version of the current scheme.

Figure 6: Cost vs adequacy of funds



Cost refers to the expected cost under each option with the assumptions discussed in previous sections.

Adequacy of funds refers to both the ability to provide adequate funds and the ability to provide the funds in a timely manner.

In Figure 6, while the current scheme appears to be relatively low cost, Table 8 demonstrates that this cost only applies to the 72 sites that have obtained a financial assurance, the EPA is exposed to the full costs of clean up at the other sites in the event of insolvency.

Table 8: Average estimated cost per participant (pa)

Option	Number of participants	Total Cost (pa)	Average cost per participant (pa)
Current scheme	72	\$4m	\$61k
Expanded current scheme	245	\$16-\$20m	\$65 – \$81k
Option 1a: Pool of funds (\$2.7m pool)	245	\$2.7m	\$11k
Option 1b: Pool of funds (\$14m pool)	245	\$4m	\$16k
Option 1c: Pool of funds (\$26m pool)	245	\$6m	\$24k

Preferred option and next steps

Option	Number of participants	Total Cost (pa)	Average cost per participant (pa)
Option 2: Recovery in arrears	245	\$2.7m	\$11k
Option 3: Insurance	245	\$40m	\$163k

The average cost per participant is expected to vary based on factors like size, past compliance etc.

Both a pool of funds and recovery in appear to be relatively low cost, but each has its advantages and disadvantages, discussed in the next section.

9.1 Comparison between a pool of funds and recovery in arrears

The analysis suggests that a pool of funds or recovery in arrears to be the most desirable options. While these options are somewhat similar in outcomes, each has its pros and cons.

Pool of funds

The following are the primary advantages of the pool of funds option:

- It would create a payment expectation among scheme participants; contribution to a pool of funds, even for those not captured by the current financial assurance scheme, becomes a cost of doing business in Victoria.
- A formula based contribution that takes account of each participants' specific characteristics is an objective and certain mechanism for recovering costs.
- *Ex ante* provision means that any scheme participant that generates costs as a result of their insolvency has made some contribution towards the recovery of those costs.
- EPA has greater control over the administration of the fund, including the development of rules regarding access to the funds. This means it can explicitly include any costs attributable to unlicensed or illegal activity (assuming they can be disentangled). This is unlikely under the insurance or at the very least, would come at considerable cost.

The following are the primary disadvantages of the pool of funds option:

- It is likely to require greater administrative costs, largely due to design, funds management and oversight.
- EPA would need to consider the process for accumulating the fund over a period of time. Some options may require a disproportionate contribution from some scheme participants during the initial years, ie until the fund is built to the desired level.
- EPA would need to consider access to funds where the pooled fund is insufficient to cover a less frequent incident of substantial cost.

Recovery in arrears

The following are the primary advantages of *ex post* recovery:

- EPA has flexibility in determining what proportion of costs it might seek to recover and the period over which recovery might occur.
- The longer term average contribution per scheme participants is likely to be lower under this option as it only seeks to recover actual costs.
- Less capital is tied up than under the pool of funds option; scheme participants are not obliged to pay for EPA uncertainty about its cost exposure.
- EPA avoids the costs associated with funds management and oversight.

The following are the primary disadvantages of *ex post* recovery:

- As there may be some delay in actually recovering costs, EPA would need to develop a process for obtaining funds in the short term (for urgent clean up activities, for example).
- Scheme participants are subject to considerable uncertainty about their expected contribution. The option does not create the expectation of a regular contribution, which may create opposition to any contribution, irrespective of its size.
- The scheme participant responsible for generating costs through its insolvency makes no actual contribution to their recovery.
- This options places considerable onus on EPA to demonstrate the effectiveness of its monitoring and enforcement activities so as to avoid creating the perception among scheme participants that costs could have been easily avoided.

Preferred option and next steps

While each of the options has identifiable advantages and disadvantages, the choice of preferred option will depend on the design and practical administration. Ultimately, many of these issues – the proportion of costs to recover, residual cost exposure, size of fund, for example – are policy decisions. EPA will need to consider the trade off between the slightly higher cost of a pool of funds and intergenerational issues with the payment variability and equity issues of the recovery in arrears option.

While the pool of funds creates a payment expectation, is less variable for industry and requires some contribution from the responsible party; these factors will need to be weighed up against the lower cost and elimination of intergeneration issues of the alternative.

Due to the close comparability of these options, the uncertainty of inputs used to undertake the analysis and the dependence and impacts on other parties, further work will likely need to be undertaken before a final decision and implementation of such an option can be undertaken.

On balance, however, PwC views the pool of funds option as the most cost effective and administratively sustainable option. The certainty and flexibility for EPA in terms of the funds available for environmental clean up are its key attributes; both of these factors are much less certain under the alternatives. Similarly, the longer term certainty it provides for scheme participants and the clear expectation of regular contributions are important considerations.

9.2 Next steps

EPA's policy preferences will ultimately guide the choice and form of the alternative to the current and proposed financial assurance scheme. However, it will be necessary to supplement any proposed scheme with the following:

- effective monitoring and enforcement of licence conditions and development of an appropriate and proportionate penalty regime.
- exhaustive pursuit of assets of companies in liquidation to honour liabilities prior to pursuing funds through some other mechanism (a pool of funds or insurance policy, for example).

Further refinement of the model

The results from PwC's modelling of EPA's cost exposure should be considered as indicative. It has drawn on cost estimates developed by GHD in conjunction with EPA but subject to further refinement in the coming months.

Similarly, insolvency rates were calculated from minimal historic data and are not specific to the purpose of the analysis. The analysis has demonstrated considerable sensitivity to the rate of insolvency. The rates of insolvency applied to the analysis are either based on limited information or are not specific enough to the type of businesses to be covered in a scheme. Furthermore, they do not consider the relative financial strength of performance of the businesses within the scheme. Gaining further confidence or knowledge in this area would dramatically increase the confidence in the analysis.

In the short to medium term, greater confidence in this analysis can be achieved by re performing the analysis once EPA collects more accurate, site specific cost estimates through its current program to update financial assurance costs, which is partly underway. It is understood that this program will capture further details on the specific conditions of each site, based on information provided by licensees. This will increase the confidence associated with potential clean-up costs at each related site.

In the longer term, EPA may be able to determine a range of potential exposures based only on information it collects and builds up over time; including actual rates of insolvencies for relevant scheduled premises, actual costs of clean-ups, known site conditions and even with consideration of the financial and operational performance of entities covered under the scheme.

With these current limitations in the data supporting the analysis it is recommended that the analysis is updated as new information is obtained and before decisions about reserving levels or the costs to impose on business are made. Furthermore, once a scheme commences, it is recommended that the analysis is updated on a yearly basis at a minimum as many of the inputs are based on dynamic information that changes year on year.

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Appendix A Consultation summary

1 Victorian Managed Insurance Authority

Consultation with the Victorian Managed Insurance Authority (VMIA) was undertaken on 13 September 2010.

VMIA were of the opinion that:

- VMIA could not offer insurance directly to private sector entities
- Providing insurance to the EPA for clean up may theoretically be possible, but would come at significant cost and would rely on a provider offering this type of policy
- An option of catastrophic insurance cover might be less cost prohibitive, but would still come at considerable cost. VMIA are also unsure of whether this would be provided by the market.

2 Environment Protection Authority

Consultation with the EPA's Financial Assurance Working Group was undertaken on 11 October 2010. This consultation took the form of a presentation with opportunity for questions on each option.

The group was generally of the option that pooled funds would more efficiently provide the required funds, and that a pool of funds specially should be considered as one of the options.

Questions also arose as to the requirements for changes to regulations and legislation for each of these options. The general conclusion was that regulations would have to be changed under all options, with a high likelihood that legislation would also be changed.

3 Department of Sustainability and Environment

Consultation with the Department of Sustainability and Environment (DSE) was undertaken on 27 October 2010 with the Chief Financial Officer and regulatory reform team.

Discussions with the CFO primarily concerned:

- The need for a financial assurance scheme
- The justification for increasing the proportion of high risk sites which are required to obtain a financial assurance
- Assessment of the options put forward by PwC.

It was agreed that:

- Insurance options may contain significant clauses to restrict scope of insurance policies, especially in relation to illegal activity
- Insurance options would represent a significant cost
- Pooled risk would be a more efficient mechanisms rather than the current scheme which provisions separately individual sites.

Discussion with the regulation reform team primarily concerned:

- The advantages and disadvantages of each potential option
- The significance of possible exit clauses and higher cost of insurance options
- Any implications of impacting of burden to business.

Appendix B Other options considered

1 Industry insurance

An industry insurance scheme would require that all relevant schedule premises would be required to obtain insurance through an existing or yet to be created statutory authority or under contract with a single private insurer.

Access to funds

The access to funds under an insurance option is likely to be more restrictive in practice when compared to a pooled type fund (Option 1). Insurance providers are likely to require strict reporting requirements in order to better understand their level of potential risk and limit their exposure through conditions and exclusion clauses.

Also, it is not clear that EPA would have access to funds in situations where costs are the result of unlicensed activity.

These options essentially take away control of the scheme from EPA and might lead to instances where EPA cannot be sure of access to funds.

Contributions

The pooled risk in this option means that overall impost on business is likely to be lower than under the current financial assurance scheme.

However, there would still be significant set up and operating costs. Following consultation with the VMIA and consultation with PwC subject matter experts, it is apparent that such an option would be costly if it were either:

- Provided by the private market – environmental type insurances are typically very expensive, primarily due to the uncertainty involved and the inability for insurance companies to adequately gauge and managed that uncertainty
- Provided by a new Government Authority – the amount recovery every year is not on the same scale as that of WorkSafe or the Traffic Accident Commission (TAC), and the administrative costs are likely to far outweigh the expected costs of clean up.

Other comparisons

This scheme might be similar to WorkSafe or the TAC scheme, and administered by an existing or yet to be created statutory authority.

Schemes already in existence in Victoria, like WorkSafe demonstrate that this option is a viable alternative, at least in theory. However, the implications of a smaller scale scheme (only paying out between say \$1 million to \$10 million) may be cost prohibitive in terms of setting up an authority to administer the mechanism.

2 Pool and CAT insurance

The combination of an industry pool and an EPA insurance policy to cover catastrophic events would provide coverage of both lower and higher cost incidents. The practical effect of which would be to reduce EPA exposure to large payouts for extreme events (on the scale of Cranbourne or even larger, for example).

The catastrophic insurance would be taken out to pay for incidents over a certain pre-defined cost, and hence the pool of funds would only need to be large enough to fund clean up events under that cost.

Other options considered

PwC and EPA have explored this option with VMIA and a number of practical issues have been identified:

- The difficulty of defining a catastrophic event – It is expected that the exact definition around what constitutes a catastrophic event will need to be carefully defined and scoped
- Specification of the terms and conditions of the policy are likely to exempt costs arising as a result of illegal or unlicensed activity
- The likely cost of taking out catastrophic insurance is likely to be prohibitive
- Even the catastrophic insurance would be capped at a maximum payout amount and hence the state would never fully be covered for the cost of clean up (even the in instance of legal activity)
- An insurance provider would need to be satisfied that EPA is minimising costs of clean up creating significant reporting requirements on the part of the EPA.

3 Financial assurance and pool

The addition of an industry pool of funds to the existing financial assurance requirements would allow for amounts not covered by the financial assurance scheme to be recovered from a pool in most instances.

This would provide EPA with greater access to funds and therefore reduce EPA financial exposure to costs associated with significant events (similar to Cranbourne).

This option would be relatively straightforward to administer as it represents an enhanced version of the current arrangements, with the addition of a pooled fund managed by EPA.

The cost implications of this option however are significant. The costs would increase the burden on business over and above the cost already imposed by the current scheme.

Any advantage of the greater level of coverage provided by this option need to be weighed up against the additional cost on business.

Even with this second level of coverage, it is highly likely that catastrophic events with high related costs would still need to be funded by the state, as the size of the industry pool would be limited in order to cap the impost on business.

4 State funded

Not considered as:

- Not consistent with the polluter pays principle
- Does not provide adequate incentives to industry.

5 Community levy on taxpayers

- Not consistent with the polluter pays principle
- Does not provide adequate incentives to industry
- Not of sufficient magnitude to justify applying a new levy on the state population.

6 Amending the current scheme

- Not cost effective
 - No pooling of funds or risk
 - More likely to under provision for individual events.

Appendix C The broader licensing scheme

The current regulatory framework is made up of a licensing scheme which is enforced by the EPA via a compliance framework.

The current licensing scheme requires that businesses obtain works approvals and/or licences to undertake work or operate certain types of premises known as 'scheduled premises'.

1 Scheduled premises

Occupiers of scheduled premises are subject to licensing requirements throughout Victoria.

- Waste treatment, disposal and recycling
- Primary industry and allied operations
- Mining
- Animal derived by products and food
- Textiles
- Wood and wood derivatives
- Chemicals including petroleum
- Non-metallic minerals
- Metals and engineering
- Printing
- Utilities
- Other (including general emissions, contaminated sites and tunnel ventilation systems).

2 Works approvals

Works approvals are required for industrial and waste management activities that have the potential for significant environmental impact.

A works approval permits the construction of a plant, the installation of equipment or modification of processes. A works approval is required where the occupier of a scheduled premises is altering the emissions or the types of wastes that they handle.

Works approvals aim to reduce the risk of industrial projects causing pollution issues and requiring expensive retrofitting.

3 Site licences

Licences are required for all scheduled premises, unless the premises is exempted under regulations. Licences cover the operation of the site and set operating, waste discharge, and waste acceptance conditions. The Environment Protection Act 1970 specifies penalties for breach of licence conditions, or for operating a site without a licence.

A licence may only be held by one or more legal entities:

- a person
- a company
- a statutory corporation
- a municipal council.

The broader licensing scheme

Licence subsequent to works approval

Where a works approval has been obtained, and the occupier believes that the works have been completed in accordance with that works approval, an application for licence (or for licence amendment if there is an existing licence for the premises) may be made to EPA.

EPA will inspect the works, and if they are found to comply with the conditions of the works approval, will issue the new or amended licence.

Licence conditions

Licences contain conditions which aim to control the operation of the premises in order to ensure that there is no adverse effect on the environment. The conditions vary depending on the type of operation but generally include:

- limits on the discharge of various substances
- monitoring requirements
- housekeeping conditions
- reporting of incidents and monitoring data.

Pollution abatement notices

EPA may serve a pollution abatement notice on the occupier of premises to control the activities on those premises in order to stop or prevent pollution or unreasonable noise from occurring.²⁴

A pollution abatement notice may be issued by EPA when a activities on any premises:

- has caused or is likely to cause pollution (including unreasonable noise)
- has caused or is likely to cause a failure to comply with:
 - any standard prescribed by the regulations
 - any order declaring policy
 - any requirements contained in any policy
 - any condition in any licence for permit
 - any neighbourhood environment improvement plan (NEIP) prepared as a result of a directed proposal.
- has created or is likely to create an environmental hazard
- is subject to an Order in Council made under section 31C
- is causing, or is likely to cause, an emission of noise that the Authority considers is, or is likely to be, unreasonable in the circumstances.

²⁴ Section 31A of the Environment Protection Act 1970.

The broader licensing scheme

The notice may require that the process, activity or use being carried on either cease or that it be modified in the manner specified. For example, the notice may require that a discharge of wastewater to the environment cease.

In other cases, the notice may specify measures to be taken, operations or activities to be conducted, or require certain apparatus or plant to be operated in a particular way. For example, to reduce noise, a factory could be required to keep all doors and windows shut after 10pm.

Information such as reports and plans showing how the process or activity will be carried on or controlled may be required as could a monitoring program.

In all cases, a time for compliance with the requirements will be specified in the notice. The minimum time a notice can specify is 30 days after the date of service of the notice.²⁵

²⁵ <http://www.epa.vic.gov.au/bus/licences/pan.asp>

Appendix D Past clean up costs

Currently data on incidents where the EPA have taken action to clean up sites is poor and only limited information of such incidents is available.²⁶

Total cost incurred by the EPA over the last ten years include:

	Incurred						Anticipated	
	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11
Cranbourne						\$4,140,676	\$522,579	
Jancassco	\$63,642	\$190,004	\$7,061,473	\$893	\$558	-\$1,307,588	\$319,800	
EcoChem						\$ 18,603	\$2,000	\$358,359
DrumBrokers							\$62,640	\$362,350
Leigh Street								\$875,000
Total (Excl Cranbourne)	\$63,642	\$190,004	\$5,753,885	\$893	\$558	\$18,603	\$384,440	\$1,595,709
Total	\$63,642	\$190,004	\$7,061,473	\$893	\$558	\$2,851,691	\$907,019	\$720,709

Jancassco 101 and 103 Ordish Rd – Abandoned hazardous waste

The EPA was notified of illegally activity in South Dandenong in early 2002 and upon investigations a large amount of hazardous waste was found.

Waste included pesticides, PCB contaminated oil, soil and solids, miscellaneous chemicals, metal skips containing capacitors and drums containing oily residues.

Table 9: Total quantity of waste

Organochlorine Pesticides		90 drums ²⁷
PCB contaminated oil		636 drums
PCB contaminated soil		508 drums
PCB solids		482 drums
Misc Chemicals		62 drums
Metal Skips containing capacitors		86 skips ²⁸
Drums containing oily residues		150 drums
Totals	86 skips	1928 drums

The responsible party alleged it was looking for finance for treatment equipment and so accepted wastes for storage to finance construction of treatment equipment.

²⁶ This is acknowledged in the recent Auditor-General's report on hazardous waste management that highlights issues with poor business information.

²⁷ Drums in this case refers to 200 litre cylindrical metal drums

²⁸ Skips in this case refers to 2x2x1.5 metre metal boxes

Past clean up costs

Three different companies were set up to hide the fact that wastes were being received and stockpiled (in the licensed facilities, over license limit, and also in a place over the road without any license).

The EPA has taken legal action against two companies after investigations uncovered hazardous waste materials stored at an unlicensed premises in Ordish Road.²⁹

Testing and Commissioning Services (Vic.) Pty Ltd (TACS) faces charges of operating an unlicensed facility and failure to comply with a Notifiable Chemical Order relating to the appropriate storage and handling of polychlorinated biphenyls (PCBs).³⁰

EPA has also a charged local waste management company, Jancassco Pty Ltd, with aiding and abetting TACS on both counts.³¹ However, the director claimed bankruptcy and was only made to undertake 300 hours of community work.

Due to the stage of some waste containers and the nature of the wastes, EPA had to take action and urgently manage the matter incurring \$6,328,782 to the end of June 2010.

Cost incurred to date:

- Phase 1: \$90,000
- Phase 2: \$606,312
- Phase 3: \$29,640
- Phase 4: \$360,000
- Phase 5: <\$8,000,000 (not able to be determined at this time).

Drum Brokers – Cahill St

Drum Brokers are a chemical drum receiver, currently in liquidation. A significant volume of chemicals in drums have been abandoned at site (20, 22 and 24 Cahill St Dandenong South). There is also some spillage of chemicals and a risk to stormwater. There is no financial assurance in place for the premises.

Clean up notices have been issued on Drum Brokers Pty Ltd and director Mr Ian Victor Pickworth. A clean up notice has also been issued on the owner of 20 Cahill Street – Fresh Fruit Juices Pty Ltd which Mr Pickworth is associated with. EPA is in negotiations with the owners of 22 – 24 Cahill Street, (A & L Riccardi) to remove wastes from site. National Australia Bank (NAB) is the mortgager of No.20 and is currently managing the site. NAB has sold the site and the new owner took possession in mid May 2010.

A prosecution brief was prepared and it is believed that this was provided to Solicitors in early May, subject to all information being provided on time.

This incident has cost the EPA \$62,640 in 2009-10 for clean up undertaken by a contractor.

Eco-Chem (10 Ebdon Street Moorabbin)

Eco-Chem Pty Ltd ('Eco-Chem') holds EPA licence EI53335 for the consolidation and storage of Prescribed Industrial Waste from the dry cleaning industry, at 10 Ebdon Street Moorabbin ('the premises'). There is no financial assurance in place for the premises.

Local dry cleaning businesses notified the EPA that the business was undercutting other competitors at levels that were not possible under the conditions of the licence.

EPA found that the company stockpiled waste beyond its licence limit of 2 tonnes. It is estimated 100 tonnes of dry cleaning waste is stored at the premises, in approximately 990 containers and drums.

²⁹ Environment Protection Authority, EPA investigations prompt action, 14 January 2002

³⁰ Skips in this case refers to 2x2x1.5 metre metal boxes

³¹ Skips in this case refers to 2x2x1.5 metre metal boxes

Past clean up costs

The condition of the storage has deteriorated to the point where containers are leaking onto the factory floor. Whilst measures have been undertaken to prevent a major spill escaping the storage area, due to the nature waste, the containers will continue to deteriorate. Impacts to groundwater and soil have not been assessed.

Clean up Notices have been issued on the Eco-Chem in Oct 2008 and both Directors.

The company is currently in liquidation.

EPA has laid charges against Eco-Chem and Director, Daryl John Owens. On 6 April 2010 in the Moorabbin Magistrates' Court, Daryl John Owens pleaded guilty to two charges under the Environment Protection Act 1970. Representing himself before Magistrate Smith, Mr Owens plead guilty to 1 charge of breach of licence involving both those conditions between 2004 and 2006 – an estimated 100 tonnes was stored on site – and 1 charge of failing to comply with a 2008 clean up notice. He was convicted on both charges:

- fined an aggregate of \$25,000
- ordered to pay EPA's costs of \$42,705.74
- ordered to pay \$265,000 compensation (for anticipated clean up costs).

The almost identical charges against the company were put before the before Magistrate Smith on 12 July 2010, where the company was convicted. The company was also fined \$25,000, ordered it to pay \$265,000 compensation and EPA costs of more than \$42,000.³²

EPA is currently organising for the waste to be repackaged for safe transport to an appropriately licensed storage facility. A public tender process will be then be initiated for the disposal of the waste.

The EPA financial report shows that the EPA incurred a total cost to date of \$20,603 (\$18,603 in 08-09 and \$2,000 in 09-10). The court case estimated that clean up costs would eventually amount to \$265,000.

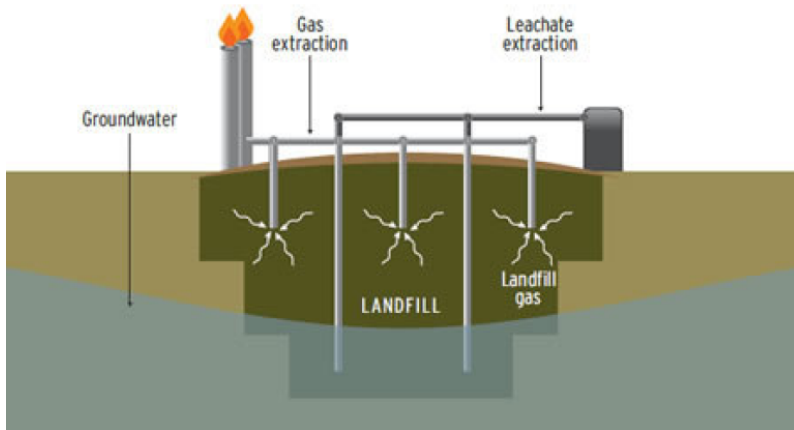


Stevensons St, Cranbourne – Brookland Greens Estate

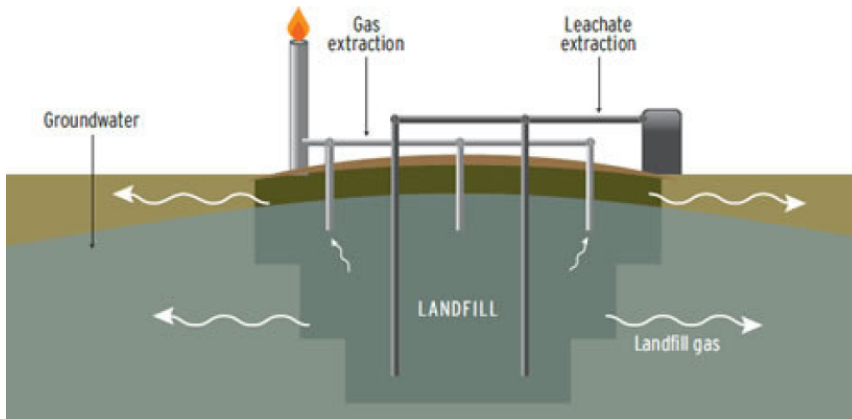
When a landfill is closed, gas and leachate (contaminated water) are produced by the decaying waste. Extraction systems are installed in landfills to remove gas and leachate.

³² insidewaste.com.au/storyviewprint.asp

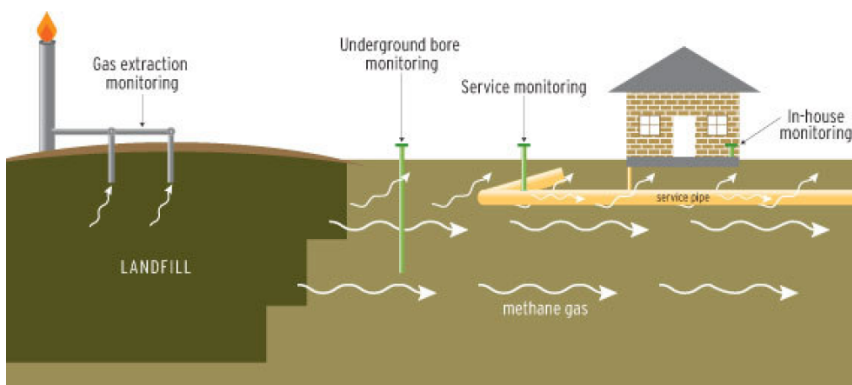
Past clean up costs



However, in this case the gas extraction system became flooded with groundwater and leachate around September 2008, inhibiting effective gas removal. As gas continued to be produced, it moved out of the sides of the landfill into surrounding land. Gas can move through the small air spaces in soil.



Gas was detected in properties in the Brookland Greens Estate in September 2008, in electrical pits and in the stormwater system at concentrations that posed a safety risk in areas of the estate. Monitors were placed in homes and around the landfill and a series of activities to address the immediate safety concerns were undertaken.



The EPA incurred clean up costs totalling \$4,663,255 between 2008-09 and 2009-10. \$3 million of this cost was a Government Funding (in the form of an appropriation or Treasurers Advance) that was provided to the City of Casey.

The Government paid \$700,000 for the Victorian Ombudsman to issue a report. (Not sure if this is included in the \$3 million amount)

Appendix E Other jurisdictions

1 US

The US Superfund was setup around 1980 to enable the Environmental Protection Agency to respond to existing hazardous waste sites and allow for funds to be provisioned to pay for the activity. This is significantly different to the objectives of the Victorian Financial Assurance scheme or an alternative scheme considered in this report. The objective in Victoria is to provide a scheme that will pay for environmental clean up in the instance of insolvency, such that funds are provided by industry rather than from the state. Despite the differences, it is nevertheless useful to understand the structure and governance arrangements of the fund.

The total cleanup costs incurred by the US Superfund are far in excess of anything expected in Victoria. The average total clean up costs have been around \$2 billion a year for the first two decades of the scheme.

The Superfund also incurs large litigation costs due to potentially responsible parties fighting such designation in the courts. It has been estimated that roughly a fourth to a half of all Superfund expenditures go to litigation to determine who should pay and how much.

The Superfund is funded primarily through general fund allocations from the Government, however general corporate tax and some special taxes levied on the petroleum and chemical industries also contribute.

2 New South Wales

In NSW, a scheme of financial assurance has been implemented, largely mirroring the scheme implemented in Victoria. The scheme allows the appropriate regulatory authority to require a licence holder to provide a financial assurance in the form of a bank guarantee, bond or another form of security considered appropriate by the appropriate authority.

This is similarly designed to secure funding to pay for environmental clean up in the case where the entity is unable to pay.

The financial assurance must be maintained during the operation of the facility and thereafter until such time as the EPA is satisfied the premises is environmentally secure.

The EPA may require an increase in the amount of the financial assurance at any time as a result of reassessment of the total likely costs and expenses of rehabilitation of the premises.³³

3 Queensland

In Queensland, financial assurances may be required for entities in the mining industry.

The administering authority may require financial assurance to be lodged as a condition of an environmental authority (petroleum activities) or as a condition of a transitional environmental program or site management plan under the Environmental Protection Act 1994.

³³ Protection of the Environment Operations Act 1997 No 156

Appendix F Schemes in other industries

1 Motor Car Traders

The Motor Car Traders (MCT) Guarantee Fund collects amounts from motor car traders to compensate consumers in the event that the consumer suffers a loss, including when a motor car trader becomes insolvent and consumers have not received monies held in trust by the motor car trader.

The fund is made up of money received from fees for licensing motor car traders and penalties paid for breaches of the Motor Car Traders Act 1986.

The Motor Car Traders Claims Committee is responsible for considering and determining claims for compensation from the fund.

The fund is available for purchases made from licensed motor car traders or someone you reasonably believed was a licensed motor car trader.³⁴

2 ESOS assurance fund

The ESOS Assurance Fund has been established under section 46 of the ESOS Act 2000 (the Act) to protect the interests of current and intending overseas students of registered providers. It will do this by ensuring that students are provided with suitable alternative courses, or have their course monies refunded, if the provider cannot provide the course(s) that the student has paid for.

The Education Services for Overseas Students (ESOS) Assurance Fund is funded by providers operating in Australia and providing education services to overseas students. In the event that an operator becomes insolvent and the student cannot be compensated or placed at another provider (at no additional cost to the student), the ESOS Assurance Fund either compensates students or uses funds to pay for an equivalent placement.

Contributions by providers are calculated based a number of factors including income from international student fees.

³⁴ Consumer Affairs Victoria.

Appendix G Modelling methodology

1 Approach

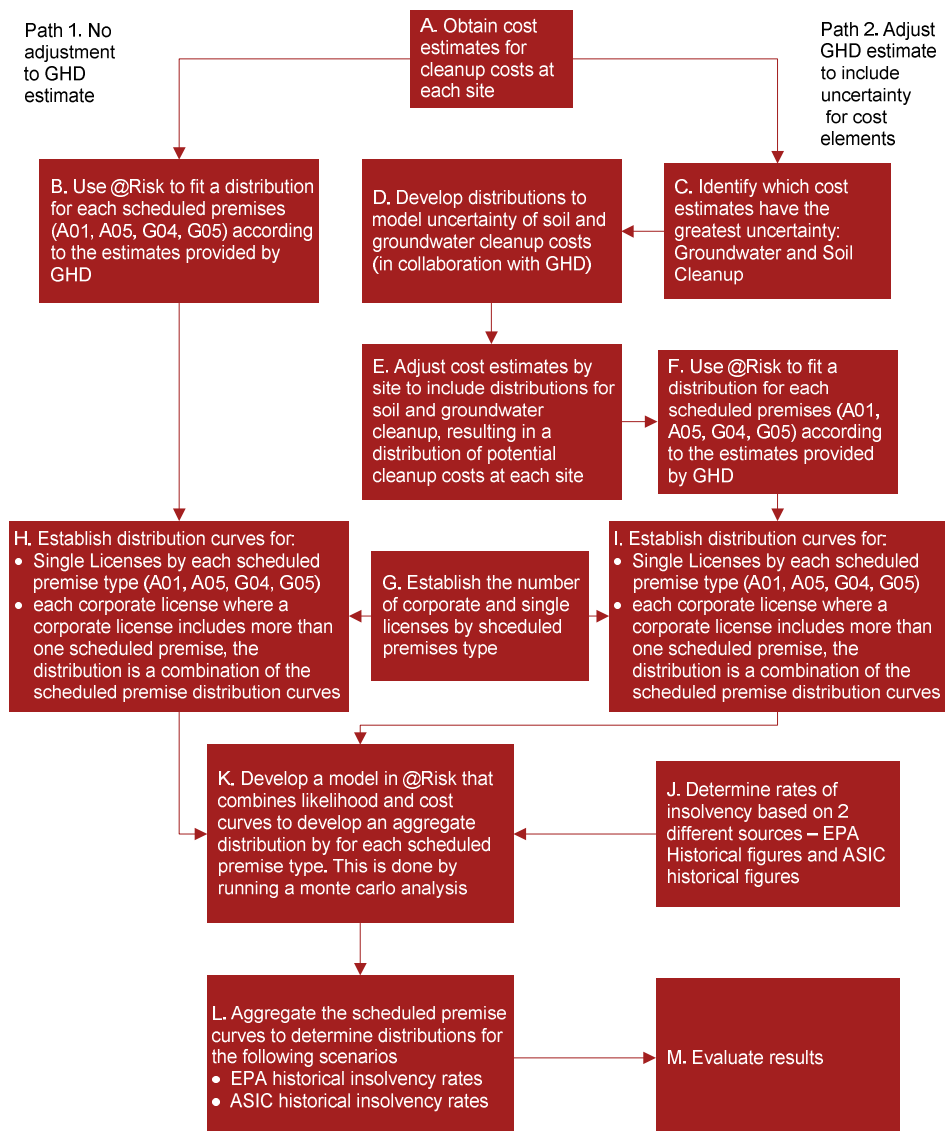
To determine the range of potential exposure for clean-up costs, a statistical technique known as monte-carlo simulation has been used. This technique allows modelling of uncertainty through random sampling across the range of a defined distribution.

The two main variables that make up the range of potential exposures for clean-up costs are:

- the expected insolvency of businesses
- the average estimated cost of clean-up of scheme participants.

The key steps involved in performing the analysis are illustrated in Figure 7.

Figure 7: Flowchart of analysis steps



2 Data sources and limitations

Likelihood of insolvency

An estimation of the future insolvency rate of scheme participants can be estimated using either:

- available EPA data on participant insolvency over the past 10 years
- average Victorian company insolvency data collected by the Australian Securities and Investment Commission (ASIC).

Data on actual scheme participants over the last ten years has the advantage of using actual data from businesses operating licensed sites, however ten years is not a sufficiently long period to provide a high level of certainty in relation to predicting future rates, nor is there any assurance that all insolvencies that incurred over this period have been captured.

Likewise, average Victorian company insolvency data collected by ASIC for all companies operating within Victoria provides a better predictor of overall insolvency, but only provides data for companies and does not restrict the sample to only scheme participants. Anecdotal evidence suggests that the businesses that are covered under an FA may be more susceptible to becoming insolvent than the average Victorian business. This assertion is supported by the respective rates of insolvency depicted below.

Due to the uncertainty or limitations of the data sets, the results using both datasets are presented for review. On balance, the EPA data provides a more realistic view of insolvencies that may be experienced under the future scheme.

EPA past insolvency data

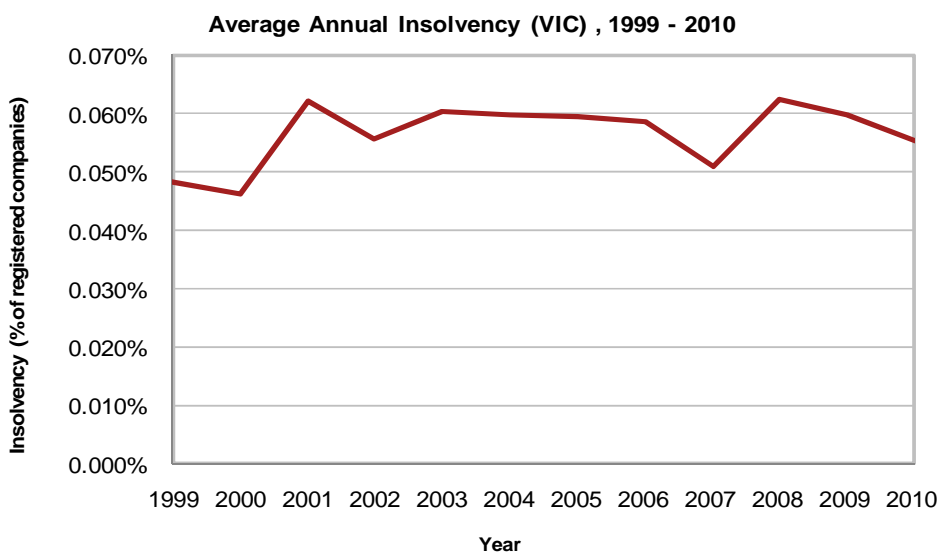
EPA data shows that there have been 4 insolvency events occur in the past ten years in relation to scheme participants. This equates to 0.4 insolvencies each year on average, or based on current scheme participant numbers, 0.174 per cent of scheme participants per year.

ASIC Victoria company insolvency data

Victorian company insolvency rates have averaged between 0.046 per cent and 0.062 per cent per annum between 1999 and 2010. This is shown in Figure 2 below.

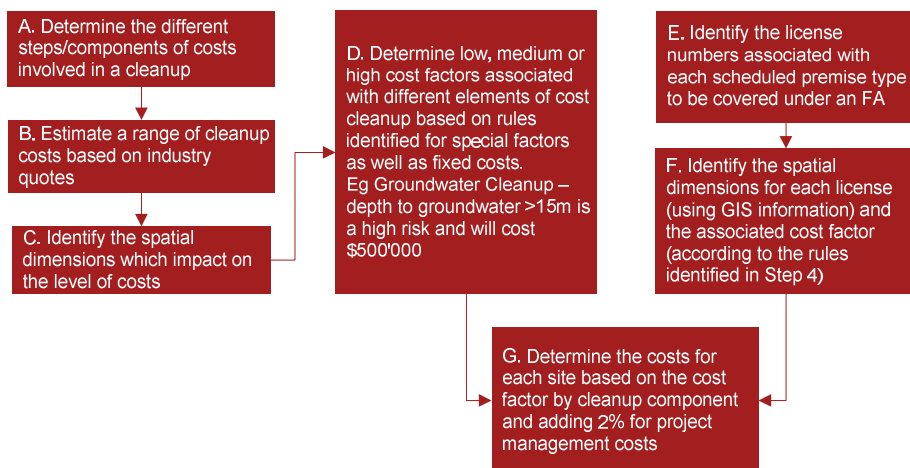
The average insolvency rate of this period was 0.057 per cent,³⁵ significantly less than the EPA insolvency data insolvency rate of 0.174.

³⁵ 0.4 insolvencies per year / an average of 229 licence holders per year across this period

Figure 8: Average annual insolvency rates (ASIC rates)

Cost data

EPA is partially through an exercise to recalculate the FA coverage required for each site, according to the relative risk level associated with the conditions of the site. Preliminary results from the work performed by GHD as part of this exercise provided the main input for cost information. The process followed by GHD to calculate the FA costs by sites covered under the scheme is outlined below:



While the exercise performed by GHD formed a valuable input to the reserving analysis, it was developed for a different purpose and is only partially complete, meaning that the data had some limitations. In addition, the data includes some key assumptions. Collectively, this influences the degree of confidence that can be placed on the current reserving analysis.

Key assumptions and limitations of the FA costing work, at this stage and for the purposes of a reserving analysis include:

- Estimates of clean-up costs are based on risk factors calculated according to spatial information details, such as land size and distance to water sources, rather than specific site details or operational practices which would typically determine relative levels of risk. Consequently, there is a substantial degree of uncertainty associated with the potential cost of a clean-up at a specific site. EPA requires further information on the specifics of the sites covered under the scheme in order to increase the accuracy of these estimates
- Due to the limited timeframe available to collect the data required for this analysis, spatial information from July 2010 was used to determine the cost risk factors. Spatial information is dynamic and will change over time according to things such as

Modelling methodology

weather conditions and zone changes (eg depth to groundwater, quality of groundwater, distance to residential zones etc), so the risk factors may not reflect current or typical conditions at each site. Even in this time, groundwater conditions have materially changed

- The cost estimates provide a relatively tight range of costs for each scheduled premise. Across all scheduled premises, the minimum estimated cost for a clean-up is \$1.67 million, which is substantially below the costs incurred by EPA for two of the four clean-up events experienced in the last ten years which cost approximately \$400k and another event which cost approximately \$900k. At the other end of the spectrum, the maximum estimate is \$9.2m, which is also higher than the costs incurred by EPA in events of the last ten years, however, is substantially less than the potential costs associated with the Cranbourne incident
- Cost data for project management costs have been assumed at 2 per cent of total cost of the clean-up. Additional work is required to gain greater confidence on this figure
- Cost estimates are based on industry quotes for hypothetical scenarios. Actual costs may differ considerably, even if the risk at a site had been adequately assessed. For example, one of the events leading to clean-up costs in the past ten years related to licence EI53335 (Eco-Chem Pty Ltd). Using the cost estimate, the clean-up for this site is estimated at \$3.7 million, whereas the actual clean-up costs were \$0.2 million. There are many reasons that could explain this discrepancy, but it demonstrates the hypothetical nature of the estimate
- On direction by EPA, GHD has estimated costs on the assumption that the site operator was meeting licence conditions and there was no illegal activity. In practice, a business that is becoming insolvent is more likely to breach licence conditions in order to reduce operating costs. Therefore, the cost estimates established by GHD may be low for the purposes of this analysis
- The current risk assessment for groundwater is based on the quality of groundwater only and does not consider depth to groundwater. Additional spatial information is required in order to consider this important factor in establishing potential groundwater clean-up costs
- Providing one cost based on a low, medium or high impact provides a false sense of accuracy for the cost estimate.
- Through consultation with GHD, it became evident that the cost estimates for two of the cost elements (groundwater and soil clean-up) could be substantially higher than estimated, particularly where site operations had been poor as may be expected for a business becoming insolvent. In extreme circumstances, we were advised that these costs could be ten to twenty times the cost estimates. An additional measure was undertaken on the dataset to address the possibility (discussed in the next section of this report).

The cost assumptions and cost factors (low, medium and high by cost element) are included in Appendix I below.

Groundwater clean-up and soil remediation costs

During discussions with the GHD team it was determined that the two cleanup categories that had the most potential to significantly increase the overall expected cleanup cost were soil remediation and groundwater cleanup costs. There are several reasons for this:

- Groundwater levels are dynamic, they rise and fall from year to year, which means the level of risk and associated cost impacts can fluctuate substantially
- From the preliminary analysis performed, it is difficult to determine the potential for and impact of the contaminant spreading into the groundwater. As such this makes it difficult to determine the most accurate cost factor to apply
- There are a number of factors than can cause the cost of soil remediation to exceed the figures provided by GHD. These include the required pre-treatment before removal and type of soil and drainage etc.

As a result of the potential fluctuations and deviations in the costs of groundwater cleanup and soil remediation a distribution was applied to these two cost components. This was undertaken by using a multiplier on the current cost estimate to develop three point estimates which could then be used to create a distribution for these costs. The multipliers are detailed in the table below and were validated with GHD before being included in the analysis.

Soil clean-up			Groundwater clean-up		
GHD Cost estimate (used as P5)	P50 multiplier	P90 multiplier	GHD Cost estimate (used as P5)	P50 multiplier	P90 multiplier
\$1m	1	1	\$0.1m	1	1
\$1.95m	1.1	1.5	\$0.2m	1.05	2

Modelling methodology

Soil clean-up			Groundwater clean-up		
\$1.97m	1.1	1.5	\$0.5m	1.1	3.3
\$3.9m	1.2	2	\$1m	1.2	3.5
			\$1.5m	1.3	4.5
			\$2m	1.5	5

The methodology used to develop these ranges was to increase the spread between P5, P50 and P90 as the risk factor (ie the higher cost estimate) increases. In addition, the level of risk is perceived to be greater for groundwater than soil clean-up. As an example, for the highest risk factor (\$2 million cost estimate for groundwater), it was assessed that there is a 10 per cent chance that the clean-up costs could be 5 times greater than the estimate.

Cost distributions for each scheduled premise category

Cost distributions were developed for each scheduled premises by using the distribution fitting function in @Risk. This function allows you to fit a probabilistic distribution to a series of data points. The data points provided by GHD provided the basis from which a distribution could be fitted, and enabled a cost curve to be developed for scheduled premise types A01, A05 and G04.

As a certain number of data points are required to successfully fit a curve, this method could not be followed for schedule premise type G05, which only had 2 data points. As the G05 data points were most similar in characteristics to the G04 data points, the G04 cost curve was used, substituting in the mean or expected cost for the G05 premises in order to develop the G05 cost curve.

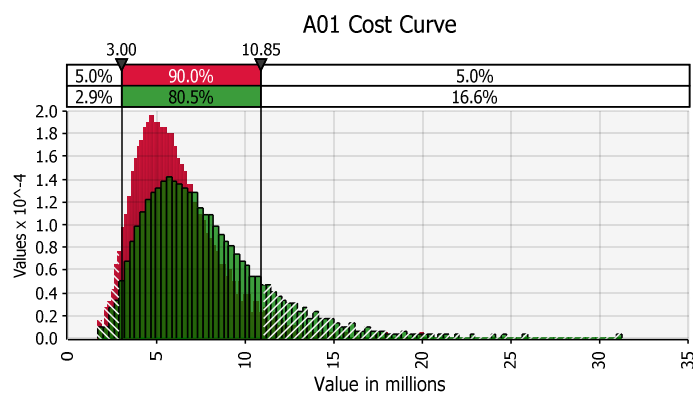
To develop the cost curve using the uncertainty around soil remediation and ground water cleanup new points including the distributions for these two cost components were developed and a distribution fitted to these data points following a similar process as outlined above.

The cost curves for each type of scheduled premise are outlined below. For each chart, the following two curves are included:

- Red distributions – GHD cost estimates
- Green distributions – GHD cost estimates adjusted to reflect uncertainty in groundwater and soil remediation.

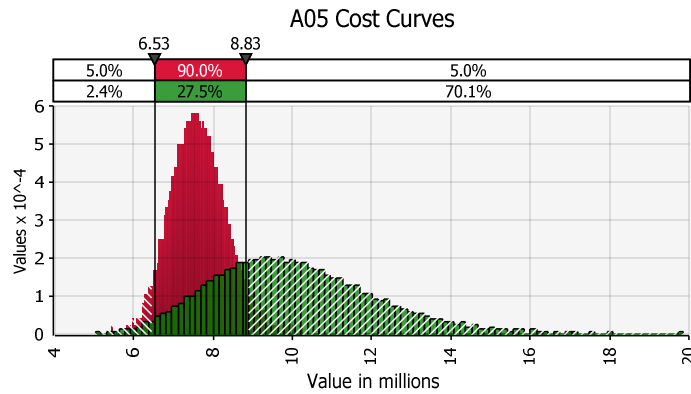
The impact of adjusting the GHD estimates is clearly evident.

A01
Prescribed Industrial Waste

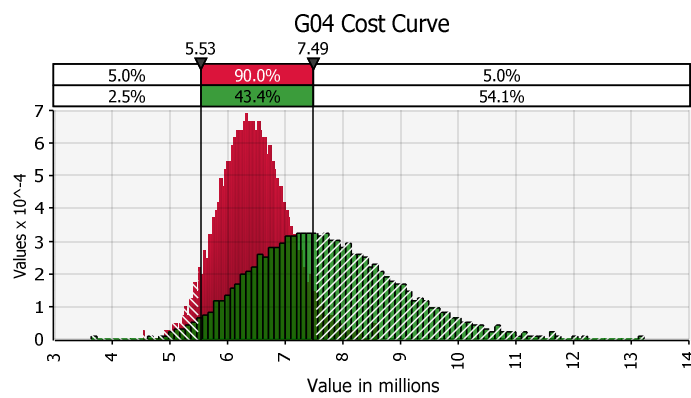


Modelling methodology

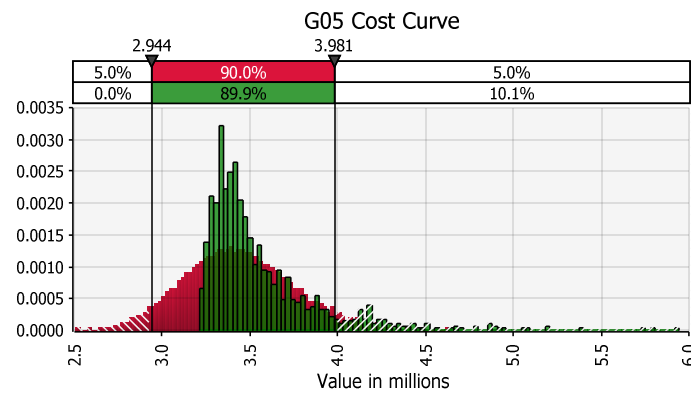
A05
Landfill



G04
Bulk Storage



G05
Container Washing



Sites, businesses and licences covered under an FA scheme

Historically, EPA has issued licences on a site basis. Through recent reforms of the licensing program, an initiative to create corporate licenses has been implemented. For the scheduled premise types to be covered under the new scheme there are currently 13 corporate licences with another 3 businesses that are expected to have corporate licences in the near future.

The breakdown of single sites and sites contained in current or expected corporate licences by the relevant scheduled premise type is included in the table below:

Modelling methodology

Schedule premise type	A01	A05	G04	G05	Total
Number of single sites	101	41	8	2	152
Number of sites within corporate licenses	24	10	0	0	34
Total number of sites	125	51	8	2	186

The significance of corporate licenses within the reserving model relates to the effects it has on both the rate of insolvency and the maximum potential exposures.

With an increase in the number of single sites converting to corporate licenses, it is expected that the likelihood of an insolvent event occurring in any given year reduces due to a decrease in the number of businesses. However, if a corporate license was to become insolvent, then it has been assumed that every site covered under the corporate license requires a clean-up cost. Therefore, the potential exists for a significant event where clean-up is required across multiple sites within a year.

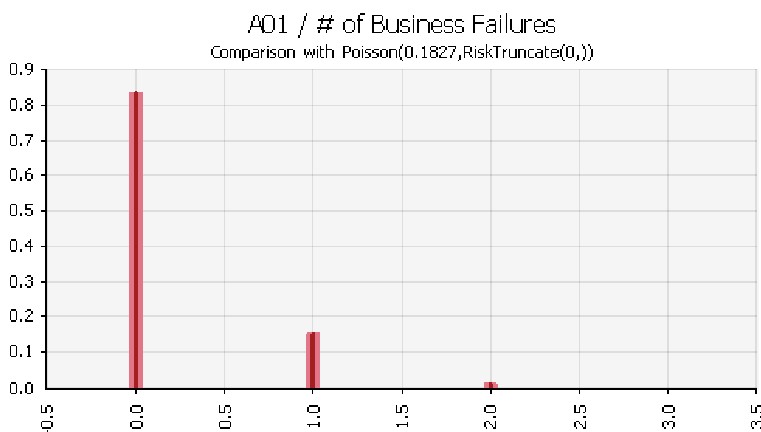
Due to the nature of the licensing and cost estimating information, it was not possible to determine the single sites that relate to a corporate license. Consequently, it has been assumed that the profile of sites within a corporate license is consistent with the profile determined through fitting distributions to the bigger dataset.

To include corporate licenses in the analysis, the following steps have been followed:

- Identify the corporate licences and the associated number of A01, A05, G04 and G05 licences within each corporate licence
- Establish a unique distribution for each corporate licence based on the specific characteristics of the corporate licence and the general distribution curves created for each scheduled premise type (eg 1 x A01 and 2 x A05 licences)
- Develop the model so that if a business with a corporate licence becomes insolvent, a clean-up cost for each site under the licence will be calculated.

Combining likelihood of insolvency with cost curves

To combine the likelihood of insolvency occurring with the cost curve of each scheduled premises to determine the overall cost curve a RiskPoisson distribution was used. This distribution takes the likelihood in any one year of a business within each of the scheduled premises categories failing (given by the total insolvency rate multiplied by the number of sites within that category) and modelling a discrete curve based on this probability. Each simulation that occurs for this curve will return a number between and including zero and infinity that corresponds to the number of insolvencies. In reality due to the very low probabilities being used in the model, only values of 0, 1, 2 or in extremely rare events 3 are returned. This is demonstrated in the chart below, which shows that there is no insolvency in the vast majority of instances, with 1 insolvency the next frequent result followed by 2 insolvencies.



3 Key assumptions

In order to analyse the data provided for meaningful and relevant results, a number of key assumptions relating to the underlying data, or method of analysis were made. These key assumptions, which influence the way in which the data can be interpreted or used, include:

- **Where a business becomes insolvent, clean-up costs will occur** – this assumes that costs cannot be recovered directly from the business that becomes insolvent and that the full extent of clean-up costs will be incurred by EPA. In reality, not all insolvencies may require a clean-up, or at the very least, EPA may not be required to pay for the full extent of the clean-up
- **Costs for a clean-up occur within the year of the insolvency occurring** – the results of the analysis have been presented to demonstrate the potential exposure in any given year. Representing the data like this assumes the full cost of a clean-up occurs within the year that an insolvency occurs. Historically, for big events, clean-up costs have been incurred by EPA for a number of years after an insolvency occurs and a clean-up commences. This needs to be considered when using the data presented to determine potential reserve levels or costs to business
- **Businesses that become insolvent are in breach of licence and therefore significant clean-up costs are required** – While the cost estimates used as an input to the model assume that businesses meet licence conditions, they also represent relatively high estimates for a given risk assessment. This is validated through comparing the clean-up costs of past events against the estimate developed using the latest procedure (as per the example of licence EI53335 in section 4)
- **All businesses considered in the analysis have the same likelihood of insolvency, including large multi-national corporations and local government entities** – despite having a greater perceived level of protection from the State, it has been assumed that local government councils have the same likelihood of becoming insolvent. Furthermore, there has been no effort to distinguish between the relative strengths of private businesses with respect to insolvency rates
- **Where a business with a corporate licence becomes insolvent, clean-up costs are incurred across all sites covered by the business' corporate licence** – in reality, only some of the business' sites may require a clean-up
- **The cost of groundwater and soil clean-up has considerably greater uncertainty than other cost elements** – multiplying factors based on subjective assumptions have been built into the analysis to address this assumption
- **Distribution curves based on sample datasets are representative of the typical profile for scheduled premises of that type** – cost estimates were developed for a sample of 147 sites, some of which are part of a corporate license. This is not the full sample of 186 sites. In order to extrapolate across all sites, the distribution curves that were developed for each scheduled premise type are assumed to be representative of the typical profile for schedule premises of that type.

4 Outputs

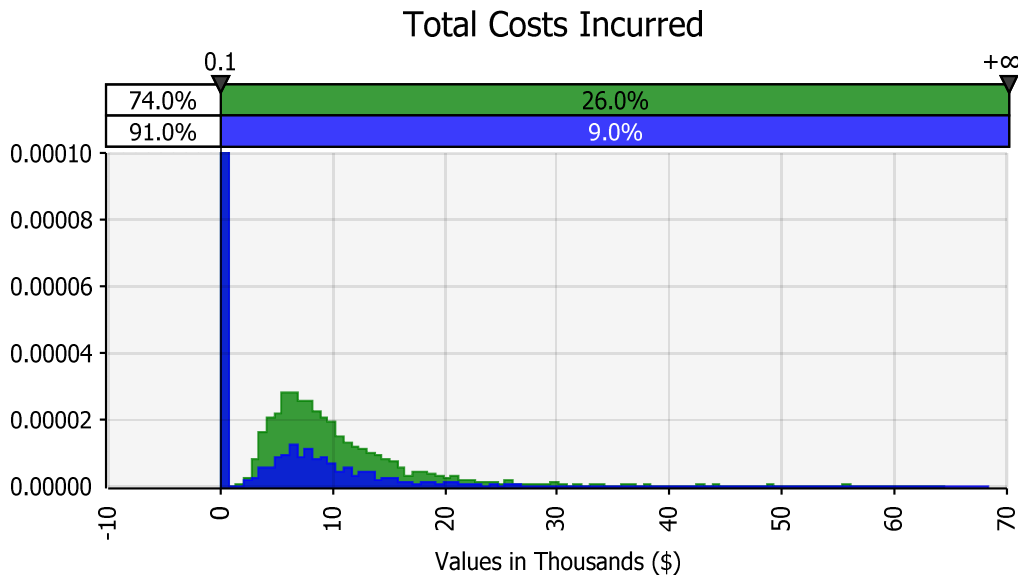
Outputs from the analysis are presented for two scenarios based on different insolvency rates:

- Scenario 1 – Insolvency rate based on EPA historical information (0.174%)
- Scenario 2 – Insolvency rate based on data available from ASIC (0.055%).

Of these scenarios, the rate based on EPA's historical information captured over the last ten years is considered more relevant as it more closely relates to the purpose of the analysis.

Key outputs of the analysis are summarised in the graphic and corresponding data table below. These outputs represent the expected long term average annual loss; ie what the cost for any given year may be the cost of a clean-up arising from an insolvency. The very high probability of a zero value distorts the graph and as such it is difficult to determine the differences between each graph. More thorough analysis can be performed using the data table.

Modelling methodology



Measure	Scenario 1		Scenario 2	
	Insolvency based on EPA rate		Insolvency based on ASIC rate	
	Value	Cost per site	Value	Cost per site
Maximum	\$ 90.4m	\$ 486k	\$ 74.4m	\$ 400k
P99.9 ³⁶	\$ 51.5m	\$ 277k	\$ 32.5m	\$ 175k
P99	\$ 25.6m	\$ 138k	\$ 14.8m	\$ 80k
P95	\$ 13.8m	\$ 74k	\$ 7.9m	\$ 42k
P90	\$ 10.1m	\$ 54k	\$ 0	\$ 0
P85	\$ 8.0m	\$ 43k	\$ 0	\$ 0
P80	\$ 6.2m	\$ 33k	\$ 0	\$ 0
P75	\$ 3.4m	\$ 18k	\$ 0	\$ 0
P70	\$ 0	\$ 0	\$ 0	\$ 0
Mean	\$ 2.7m	\$ 15k	\$ 0.9m	\$ 5k
Confidence limit at the mean	74.5%		91.2%	
Percentage of times a zero result is returned (ie there is no insolvency)	74%		91%	

The results of the analysis demonstrate that:

³⁶ P_{xx} = probability that the corresponding value will not be exceeded in any given year. For example, the P90 for scenario 1 suggests that, according to the model, there is 90% confidence that the cost of clean-up in any given year will be less than \$10.1m.

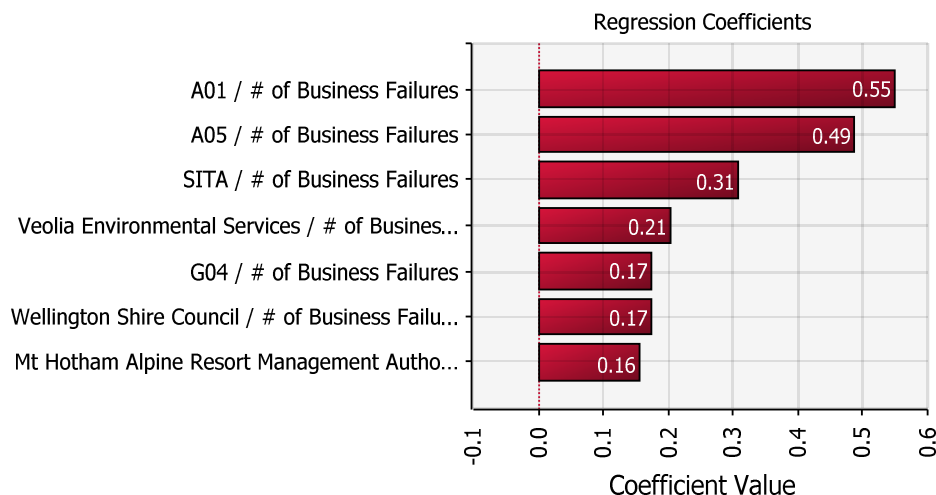
Modelling methodology

- For scenario 1, approximately 70 per cent of the time (or 7 out of 10 years) it is expected that an insolvency does not occur. The likelihood of an insolvency occurring reduces to approximately 10% when using the ASIC data
- For scenario 1, when an insolvency does occur, the clean-up has the potential to be as high as approximately \$90m, although the probability of a loss this big is far less than a 1 in 1000 chance. This scenario relates to a circumstance where there is a failure of a corporate licence which has multiple sites (eg Veolia Environmental Services or SITA)
- The mean value can be thought of as the amount that is needed to be collected each year to break even across the life of a period. It is the sum of all the losses averaged out over the time scale. For example, under scenario 1, the average cost of clean-up over an extended period of time is expected to be \$2.7 million a year. Therefore, if the value of a reserve was set at the mean, when an insolvency does occur it is likely that it would be above the mean. For example if the reserve was set at the mean for scenario 1 and an insolvency occurs there is only a very low likelihood (approximately 2%) that the cleanup costs will be less than the reserve.

The value for the mean in scenario 1 (\$2.7m) is considerably higher than the average cost experienced by EPA over the past ten years (\$0.8m). This is driven by the limitations in the cost estimates that formed the basis of the analysis, particularly in relation to the hypothetical nature of the estimate and the potential for considerable variance between estimated and actual costs, as well as the nature of the events that have occurred. Using historical data of only ten years of clean-up costs cannot be fully relied upon.

As demonstrated by the difference between the two scenarios, the likelihood of insolvency is a key driver of variability within the model. Neither of the two insolvency rates used in this analysis is based on reliable information – improving the accuracy of this information would considerably enhance the reliability of the outputs from the model.

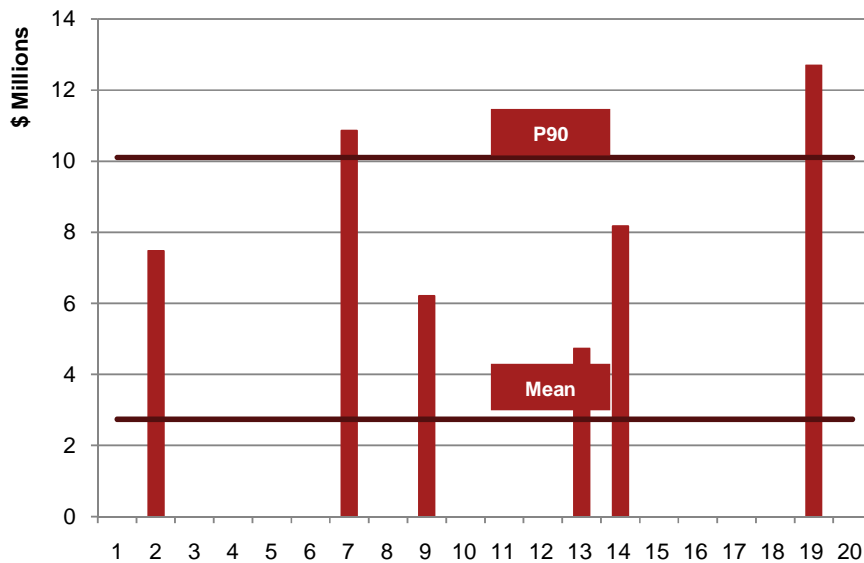
A Tornado chart can be used to determine the inputs that are the key drivers of variability within the model. As can be seen below the key drivers of variability within this analysis are the likelihoods of insolvency for the A01 scheduled premises and the Corporate Licenses which have multiple sites.



Any decisions regarding the most appropriate level for risk reserving should consider the potential timing of the loss events and the effect this would have and the development and maintenance of the risk reserve.

The outputs of the analysis can also be presented to demonstrate what the clean-up costs could reasonably look like over a period of time based on the outputs of the model. For example, the chart below demonstrates what a 20 year period could look like for scenario 1. It was generated by taking 20 random sample outputs from the model; it does not represent a typical 20 year period and should only be considered as a hypothetical scenario. For example, there is no high impact cost event included in this sample.

Modelling methodology



This chart is particularly useful when considering the practicality of administering and managing a pool of funds.

For an industry pool of funds (Option 1), it shows that:

- Reserving at the mean level would not be sufficient in any of the years that a clean-up is required
- Reserving at the P90 level would provide sufficient coverage for 9 out of 10 years. This would mean additional funding may need to be sourced for 1 in 10 years
- Building up the pool of funds could be difficult if an event was to occur in one of the early years, as per the hypothetical scenario above. The desire to swiftly build up to the desired reserve level needs to be balanced against the cost to business. For example, it would cost approximately \$54,000 per site to provision to a P90 level in one year for scenario 1
- The decision of which confidence level to reserve at is a critical one, requiring consultation with other stakeholders who may be responsible for any cost impacts above the reserve amount. A useful reference point is to consider how an established reserve would handle a single high consequence (but plausible) event. For instance the P90 value for the site with the highest cost estimate could be used as a reference point – This figure is \$15.85 million, based on a site within the A05 scheduled premise.

Where emerging costs are recovered by industry (Option 2), this chart demonstrates the fluctuation in costs that may result and the unpredictable nature of the costs. In the example above the cost per site fluctuates from \$0 in most instances to approximately \$27k at the lowest level of clean-up to approximately \$67k for the most expensive clean-up.

Likewise for an insurance scheme (option 3), the chart demonstrates the unpredictable nature of the events and cash flows, which could have a strong influence on the level of premiums associated with an insurance related product.

Appendix H Average insurance premium and claim data

Table 10: Insurance analysis for APRA general insurance data

Total	Claims : Premiums	Standard Deviation	Co-efficient of variation
Fire and ISR	183%	691.93	0.40
Consumer credit	478%	25.88	0.44
Public and product liability	246%	347.58	0.37
Professional indemnity	167%	284.49	0.33
House owners/householders	151%	734.38	0.27
Commercial motor vehicle	118%	246.87	0.19
Domestic motor vehicle	111%	831.79	0.17
Travel	272%	71.44	0.37
Marine and aviation	196%	48.60	0.15
Mortgage	713%	227.76	0.85
Other accident	240%	55.55	0.13
Other	237%	112.60	0.33
CTP motor vehicle	111%	588.27	0.27
Employers' liability	144%	289.38	0.33

Appendix I GHD cost estimates

General cost assumptions by cost element

Cost element	Cost estimation assumptions
Drilling:	\$200 – \$500/m, depending on geology – the harder the geology, the more expensive the cost. Costs include site establishment, labour, cleanup, etc.
Facility Hazard Inspection:	1 to 2 days site inspection (2 staff), plus two days reporting, plus 10 – 20 per cent above costs for laboratory analysis. Staff rate \$170/hr
Environmental Audit:	\$40,000 minimum for an orphaned, EPA inherited site. Other cost factors cannot be determined from the basic input.
Pre-clean up risk assessment study:	Costs based on number of bores, plus geology, with corresponding reporting – more bores, more data to be reviewed and the more complex the reports.
Soil Clean Up	Costs based on transport and disposal to landfill of Category B and C waste (Cat A requires pre-treatment to Cat B before disposal to landfill. Using current hazardous transport and landfill gate fees, assuming transport distance is metro-based.
Surface Water Remediation	Assuming that the various cost levels (Hi, Med, Lo) are based on the area of surface water affected.
Groundwater Remediation	Costs based on depth to affected groundwater, aquifer type, pollutant type. Lower costs have less mobile pollutants and accessible aquifers – higher costs have mobile pollutants and inaccessible aquifers.
Sediment Remediation	Costs based on whether sediment can be disposed to ocean or landfill, and the volume to be extracted and disposed. Ocean disposal is cheaper, as landfill disposal of hazardous industrial waste in Victoria is very expensive.
Gas Remediation	Costs for remediation are based on the affected area requiring cleanup

Cost estimates for Scheduled Premise Type A01

Cost element	Low	Medium	High	Cost estimate
Site Assessment	70	130	275	<p>Low:</p> <ul style="list-style-type: none"> • 3 groundwater monitoring bores to 10 m depth in unconsolidated sediments • 1 day hazardous material inspection • \$40,000 environmental audit • \$15,000 for reporting. <p>Medium:</p> <ul style="list-style-type: none"> • 5 groundwater monitoring bores to 15 m depth in hard rock • 1 day hazardous material inspection • \$40,000 environmental audit • \$50,000 reporting. <p>High:</p> <ul style="list-style-type: none"> • 15 nested groundwater monitoring bores (30 in total) to 10 m and 20 m depth respectively in hard rock • 1 day hazardous material inspection • \$40,000 environmental audit • \$100,000 reporting.
Soil Clean Up	1000	1970	3900	Low:

GHD cost estimates

Cost element	Low	Medium	High	Cost estimate
				<ul style="list-style-type: none"> • 250 m³ of Category A soil requiring excavation and disposal to landfill • \$20,000 for reporting. <p>Medium:</p> <ul style="list-style-type: none"> • 500 m³ of Category A soil requiring excavation and disposal to landfill • \$75,000 reporting. <p>High:</p> <ul style="list-style-type: none"> • 1,000 m³ Category A soil requiring excavation and disposal to landfill • \$100,000 reporting.
Surface Water Clean Up	250	500	1000	<p>Low:</p> <p>< 1ha impacted area.</p> <p>Medium:</p> <p>> 1 ha < 3 ha impacted area.</p> <p>High:</p> <p>> 3 ha < 5 ha impacted area</p>
Sediment Clean Up	390	500	750	<p>Low:</p> <p>100 m³ of Category A terrestrial sediment requiring excavation and disposal to landfill, \$15,000 for reporting</p> <p>Medium:</p> <p>250 m³ of Category A sediment requiring dredging and ocean disposal, \$25,000 reporting.</p> <p>High:</p> <p>500 m³ Category A sediment requiring dredging and ocean disposal, \$50,000 reporting</p>
Pre-Treatment	100	250	500	<p>Low:</p> <p>100 m³ of Cat A soil requiring pre-treatment to Cat B, \$15,000 for reporting</p> <p>Medium:</p> <p>250 m³ of Cat A soil requiring pre-treatment to Cat B, \$25,000 reporting.</p> <p>High:</p> <p>500 m³ Cat A soil requiring pre-treatment to Cat B, \$50,000 reporting</p>
Groundwater Clean Up	500	1000	2000	<p>Low:</p> <p>Depth to groundwater < 5 m, soluble COCs, unconsolidated sedimentary aquifer, < 1 ha impacted aquifer area.</p> <p>Medium:</p> <p>Depth to groundwater >5 m <15 m, semi-soluble COCs, unconsolidated sedimentary aquifer, < 1 ha impacted aquifer area.</p> <p>High:</p> <p>Depth to groundwater > 15 m, NAPL+soluble COCs, hard fractured rock aquifer, < 5 ha impacted aquifer area.</p>
Gas Clean Up	250	500	1000	<p>Low:</p> <p>< 1 ha gas affected area</p> <p>Medium:</p> <p>> 1 ha < 5 ha gas affected area</p> <p>High:</p> <p>> 5 ha < 10 ha gas affected area</p>

GHD cost estimates

Cost estimates for Scheduled Premise Type A05

Cost element	Low	Medium	High	Cost estimate
Site Assessment	70	130	275	<p>Low:</p> <ul style="list-style-type: none"> • 3 groundwater monitoring bores to 10 m depth in unconsolidated sediments • 1 day hazardous material inspection • \$40,000 environmental audit • \$15,000 for reporting. <p>Medium:</p> <ul style="list-style-type: none"> • 5 groundwater monitoring bores to 15 m depth in hard rock • 1 day hazardous material inspection • \$40,000 environmental audit • \$50,000 reporting. <p>High:</p> <ul style="list-style-type: none"> • 15 nested groundwater monitoring bores (30 in total) to 10 m and 20 m depth respectively in hard rock • 1 day hazardous material inspection • \$40,000 environmental audit • \$100,000 reporting.
Soil Clean Up	1970	3870	3900	<p>Low:</p> <ul style="list-style-type: none"> • 500 m³ of Category B soil requiring excavation and disposal to landfill • \$50,000 for reporting <p>Medium:</p> <ul style="list-style-type: none"> • 1000 m³ of Category B soil requiring excavation and disposal to landfill • \$75,000 reporting. <p>High:</p> <ul style="list-style-type: none"> • 1,000 m³ Category A soil requiring excavation and disposal to landfill • \$100,000 reporting
Surface Water Clean Up	250	500	750	<p>Low:</p> <p>< 1ha impacted area.</p> <p>Medium:</p> <p>> 1 ha < 3 ha impacted area.</p> <p>High:</p> <p>> 3 ha < 5 ha impacted area</p>
Sediment Clean Up	250	500	750	<p>Low:</p> <p>100 m³ of Category A terrestrial sediment requiring excavation and disposal to landfill, \$15,000 for reporting</p> <p>Medium:</p> <p>250 m³ of Category A sediment requiring dredging and ocean disposal, \$25,000 reporting.</p> <p>High:</p> <p>500 m³ Category A sediment requiring dredging and ocean disposal, \$50,000 reporting</p>
Pre-Treatment	100	250	500	<p>Low:</p> <p>100 m³ of Cat A soil requiring pre-treatment to Cat B, \$15,000 for reporting</p> <p>Medium:</p> <p>250 m³ of Cat A soil requiring pre-treatment to Cat B, \$25,000 reporting.</p>

GHD cost estimates

Cost element	Low	Medium	High	Cost estimate
				High: 500 m ³ Cat A soil requiring pre-treatment to Cat B, \$50,000 reporting
Groundwater Clean Up	500	1000	2000	Low: Depth to groundwater < 5 m Soluble COCs Unconsolidated sedimentary aquifer < 1 ha impacted aquifer area. Medium: Depth to groundwater >5 m <15 m Semi-soluble COCs Unconsolidated sedimentary aquifer < 1 ha impacted aquifer area. High: Depth to groundwater > 15 m NAPL+soluble COCs Hard fractured rock aquifer < 5 ha impacted aquifer area.
Gas Clean Up	500	1000	2000	Low: < 1 ha gas affected area Medium: > 1 ha < 5 ha gas affected area High: > 5 ha < 10 ha gas affected area

Cost estimates for Scheduled Premise Type G04

Cost element	Low	Medium	High	Cost estimate
Site Assessment	70	130	275	Low: <ul style="list-style-type: none"> • 3 groundwater monitoring bores to 10 m depth in unconsolidated sediments • 1 day hazardous material inspection • \$40,000 environmental audit • \$15,000 for reporting. Medium: <ul style="list-style-type: none"> • 5 groundwater monitoring bores to 15 m depth in hard rock • 1 day hazardous material inspection • \$40,000 environmental audit • \$50,000 reporting. High: <ul style="list-style-type: none"> • 15 nested groundwater monitoring bores (30 in total) to 10 m and 20 m depth respectively in hard rock • 1 day hazardous material inspection • \$40,000 environmental audit • \$100,000 reporting.
Soil Clean Up	1970	3870	3900	Low: <ul style="list-style-type: none"> • 500 m³ of Category B soil requiring excavation and disposal to landfill

GHD cost estimates

Cost element	Low	Medium	High	Cost estimate
				<ul style="list-style-type: none"> • \$50,000 for reporting <p>Medium:</p> <ul style="list-style-type: none"> • 1000 m³ of Category B soil requiring excavation and disposal to landfill • \$75,000 reporting. <p>High:</p> <ul style="list-style-type: none"> • 1,000 m³ Category A soil requiring excavation and disposal to landfill • \$100,000 reporting
Surface Water Clean Up	250	500	1000	<p>Low:</p> <p>< 1ha impacted area.</p> <p>Medium:</p> <p>> 1 ha < 3 ha impacted area.</p> <p>High:</p> <p>> 3 ha < 5 ha impacted area</p>
Sediment Clean Up	390	250	500	<p>Low:</p> <p>100 m³ of Category B terrestrial sediment requiring excavation and disposal to landfill</p> <p>\$15,000 for reporting</p> <p>Medium:</p> <p>500 m³ of Category B sediment requiring dredging and ocean disposal</p> <p>\$25,000 reporting.</p> <p>High:</p> <p>500 m³ Category A sediment requiring dredging and ocean disposal</p> <p>\$50,000 reporting</p>
Pre-Treatment	100	250	500	<p>Low:</p> <p>100 m³ of Cat A soil requiring pre-treatment to Cat B, \$15,000 for reporting</p> <p>Medium:</p> <p>250 m³ of Cat A soil requiring pre-treatment to Cat B, \$25,000 reporting.</p> <p>High:</p> <p>500 m³ Cat A soil requiring pre-treatment to Cat B, \$50,000 reporting</p>
Groundwater Clean Up	250	500	1500	<p>Low:</p> <p>Depth to groundwater < 5 m</p> <p>Soluble COCs</p> <p>Unconsolidated sedimentary aquifer</p> <p>< 1 ha impacted aquifer area.</p> <p>Medium:</p> <p>Depth to groundwater >5 m <15 m</p> <p>Semi-soluble COCs</p> <p>Unconsolidated sedimentary aquifer</p> <p>> 1 ha < 5 ha impacted aquifer area.</p> <p>High:</p> <p>Depth to groundwater > 15 m</p> <p>NAPL+soluble COCs</p> <p>Hard fractured rock aquifer</p> <p>> 5 ha impacted aquifer area.</p>

GHD cost estimates

Cost element	Low	Medium	High	Cost estimate
Gas Clean Up	250	500	1000	<p>Low:</p> <p>< 1 ha gas affected area</p> <p>Medium:</p> <p>> 1 ha < 5 ha gas affected area</p> <p>High:</p> <p>> 5 ha < 10 ha gas affected area</p>

Cost estimates for Scheduled Premise Type G05

Cost element	Low	Medium	High	Cost estimate
Site Assessment	70	100	150	<p>Low:</p> <ul style="list-style-type: none"> • 3 groundwater monitoring bores to 10 m depth in unconsolidated sediments • 1 day hazardous material inspection • \$40,000 environmental audit • \$15,000 for reporting. <p>Medium:</p> <ul style="list-style-type: none"> • 3 groundwater monitoring bores to 15 m depth in hard rock • 1 day hazardous material inspection • \$40,000 environmental audit • \$25,000 reporting. <p>High:</p> <ul style="list-style-type: none"> • 5 nested groundwater monitoring bores (10 in total) to 10 m and 20 m depth respectively in hard rock • 1 day hazardous material inspection • \$40,000 environmental audit • \$50,000 reporting.
Soil Clean Up	395	1920	1950	<p>Low:</p> <ul style="list-style-type: none"> • 100 m³ of Category B soil requiring excavation and disposal to landfill • \$15,000 for reporting <p>Medium:</p> <ul style="list-style-type: none"> • 500 m³ of Category B soil requiring excavation and disposal to landfill • \$25,000 reporting. <p>High:</p> <ul style="list-style-type: none"> • 500 m³ Category A soil requiring excavation and disposal to landfill • \$50,000 reporting
Surface Water Clean Up	100	250	500	<p>Low:</p> <p>< 1ha impacted area.</p> <p>Medium:</p> <p>> 1 ha < 3 ha impacted area.</p> <p>High:</p> <p>> 3 ha < 5 ha impacted area</p>
Sediment Clean Up	390	250	500	<p>Low:</p> <p>100 m³ of Category B terrestrial sediment requiring excavation and disposal to landfill, \$15,000 for reporting</p> <p>Medium:</p>

GHD cost estimates

Cost element	Low	Medium	High	Cost estimate
				500 m ³ of Category B sediment requiring dredging and ocean disposal, \$25,000 reporting. High: 500 m ³ Category A sediment requiring dredging and ocean disposal, \$50,000 reporting
Pre-Treatment	100	250	500	Low: 100 m ³ of Cat A soil requiring pre-treatment to Cat B, \$15,000 for reporting Medium: 250 m ³ of Cat A soil requiring pre-treatment to Cat B, \$25,000 reporting. High: 500 m ³ Cat A soil requiring pre-treatment to Cat B, \$50,000 reporting
Groundwater Clean Up	100	250	500	Low: Depth to groundwater < 5 m, soluble COCs, unconsolidated sedimentary aquifer, < 1 ha impacted aquifer area. Medium: Depth to groundwater >5 m <15 m, semi-soluble COCs, unconsolidated sedimentary aquifer, < 1 ha impacted aquifer area. High: Depth to groundwater > 15 m, NAPL+soluble COCs, hard fractured rock aquifer, < 1 ha impacted aquifer area.
Gas Clean Up	0	0	0	Not applicable for container washing facilities.

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