
EXPLANATORY NOTES FOR LANDFILL SITES CLOSING BEFORE 2010

MARCH 2008

**Explanatory notes for landfill sites
closing before July 2010**

Landfill guidelines for sites closing before July 2010

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ISBN 978-1-921125-67-6

March 2008

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1 BACKGROUND TO ISSUE

Closure and post-closure management of landfills minimises the generation and uncontrolled emission of leachate and landfill gases, which may have adverse impacts on human health or the environment. Critical to a closure plan therefore, is the construction of a landfill cover system that will minimise the infiltration of water from precipitation after the landfill has been closed (or for currently operational landfills, progressive closure of landfill stages) and limit the uncontrolled release of landfill gases.

Key objectives described in South Australia's Strategic Plan relevant to environmentally appropriate landfill closure in particular are 'improving well-being' and 'attaining sustainability'. The effective and environmentally sound closure of landfills also supports the Environment Protection Authority's (EPA) vision for a clean, healthy environment that supports social and economic prosperity for all South Australians and is strongly aligned with our mission to manage and influence human activities to protect, restore and enhance the environment and to support human well-being.

2 RELEVANT SECTIONS OF THE ACT

Landfills are a prescribed activity of environmental significance under clause 3(3) of Schedule 1 of the *Environment Protection Act 1993*, being the conduct of a depot for the reception, storage, treatment or disposal of waste. Under this Schedule, landfills are required to be licensed. Licences need to remain while impacts and activities associated with the disposal of waste continue. This includes closure, capping and monitoring. The EPA does not charge a licence fee for landfill sites that have ceased to receive waste but remain licensed for closure and post closure activities. If another scheduled activity (such as a transfer station) is proposed for the site, then this will still also require a licence and the relevant fee is charged.

Sites not proposing to operate beyond July 2010 can either close prior to July 2008 to an acceptable negotiated standard, or must at least have a closure plan submitted and approved by the EPA prior to July 2008. As some aspects of the guidelines may not apply to some individual sites, the standards for closure under these circumstances can be negotiated with the EPA.

Note: Full compliance is required for sites operating past July 2010.

The EPA will require sites to be managed until the facility no longer poses an unacceptable risk to the environment. For older smaller sites, this is unlikely to be the default 25 years as described in the guidelines and closure may simply require some simple works to ensure sufficient cover, control of stormwater and monitoring and maintenance of the cap and surface rehabilitation.

Tools are available under the Act which may be used, as applicable, to achieve this including Environment Protection Orders for the Cessation of an Activity (Section 93A), Condition of Licence to require Closure Plans (S52A), General Environmental Duty (Section 25), or simple renewal of licences including under Section 43(6) or 43(7).

3 GENERAL GUIDELINES AND FURTHER ADVICE

The closure aspects in the landfill guidelines apply to:

- future landfill cells at all facilities
- current landfill cells that do not have a closure plan approved by the EPA
- closed sites where the EPA considers that closure or post-closure management is required to adequately guard against pollution.

The approach that EPA will take in relation to full closure of old landfills and those proposing closure prior to 1 July 2008, is a risk-based approach. Remedial actions will need to be proposed in a closure programme forming part of an overall Closure Plan document. Councils/operators must satisfy themselves and justify a programme of full closure in consultation with the EPA, such that there will be negligible remaining health or environmental risk. The owners/operators need to ensure that they manage their current and future liability posed by landfill activities.

For old landfills that have ceased operation but not necessarily closed to an acceptable standard, much of this work may be able to be completed by desk top assessment and minimal field investigation. Any higher risk issues may need the engagement of a consultant, such as to interpret groundwater information to provide the necessary information on quality, background, flow direction, risks and impacts or conduct further field investigation.

It is strongly recommended that you contact your licence coordinator to discuss the above requirements prior to engaging the services of an environmental consultant (assuming you choose to engage one). This is to ensure that the issues to be addressed are relevant to the site and design considerations can be discussed. If you choose to engage a consultant this will enable them to specifically focus on the critical components required for closure. However in all cases, the proposed closure and post closure plan must include:

- all areas of waste management including historic waste disposal areas at the site
- design and management that is consistent with and supports the intended after-use for the site
- a timetable for progressive implementation
- closure and post closure responsibilities.

The standards for closure in the landfill guideline are for sites that have engineered leachate containment and collection systems. As such, older sites wishing to close before the prescribed timeframes, should do a site specific assessment and may be able to justify that they do not require the standards as set out in the *EPA Guidelines: Environmental management of landfill facilities (municipal solid waste and commercial and industrial general waste) 2007* <www.epa.sa.gov.au/pdfs/guide_landfill.pdf>. However the general outcomes of matching the closure to the after use, minimising infiltration, ensure final shaping promotes controlled stormwater diversion, prevent exposure to humans and control landfill gas emissions as necessary, are still required to be considered.

4 THE CLOSURE PLAN

The objectives of closure and post-closure plans for landfill facilities are provided in Section 12 of the landfill guidelines: These include to:

- provide long-term protection of human health and the environment
- minimise the generation and uncontrolled emissions of leachate and landfill gas, which may have adverse impacts on human health or the environment
- promote responsible land management and ensure that site closure and post-closure management are compatible with an appropriate post-closure use of the site

- manage hazards and amenity issues
- maintain environmental protection measures and monitoring systems until it is demonstrated that the landfill no longer presents a risk to human health or the environment.

The **expected outcomes** are also described in Section 12 of the guidelines.

The plan should be prepared in accordance with the principles of continuous improvement outlined in *AS/NZS ISO 14001:1996 Environmental management systems— specification with guidance for use*, including the cycle of policy, planning, implementation, checking, corrective action and management review.

Plans will require EPA approval before implementation and for sites continuing to operate beyond 2010, must be reviewed by the licensee at least every two years, as outlined in Section 12.2.

The plan must include a program for implementation (as a Gantt chart or similar format) and a program of quality assurance and reporting to the EPA.

Landfill operators proposing to continue operation should make funding provision during landfill operation to cover costs for closure and post-closure management.

5 PROCESS

Essentially, the relevant sections of a Closure Plan, whether for an old site or for sites that need to prepare a Closure Plan in accordance with the Landfill Guidelines, are given in Section 12 of the landfill guidelines. Those headings and section summaries (in italics) have been given along with further suggestions for information that councils may have at hand relevant for inclusion in the Closure Plan.

- The first step will be to gather and review existing information about the landfill site as background to provide a framework for the proposed closure.
- The next step is to gather any additional information identified in a gap analysis style review of existing information.
- A desktop risk assessment should be conducted on each of the aspects and potential impacts to determine the overall risk posed to then identify and support the proposed closure actions.
- Develop a Closure Plan (in consultation with EPA as needed).
- Submit Closure Plan to the EPA for approval.

6 THE CLOSURE PLAN—INFORMATION TO CONSIDER

A programme of works, actions, timeframes, roles and responsibilities should be included in the closure plan. An ‘as constructed’ report needs to be submitted to the EPA detailing the level of supervision, quality assurance, quality controls and relevant reporting to be implemented. Consideration should be given in regard to the risks posed by the site to surface and groundwater and the air environment and to land and human health:

- from leachate
- from landfill gas
- from the types, location and nature of waste
- in the specific site setting and proposed after-use

The extent of information that each site may need to address will vary depending on the level of risk posed and current state of closure achieved at the site. This may extend from a site

conducting a general desk top assessment of data at hand including groundwater depth, waste types and extent of landfilled, and current landform.

Some small sites may then only require some additional cover material, contouring and revegetation work to shed water away from waste disposal areas and control stormwater runoff and erosion. Other sites may require more extensive investigation including some additional field investigation to understand risks better and then may require an engineered capping system to be applied.

In all cases, councils are advised to consider the suggested closure methods and required outcomes set out in the EPA Guidelines: Environmental management of landfill facilities (municipal solid waste and commercial and industrial general waste). However not all aspects of the guidelines will be applicable to some individual sites and thus the standards for closure under these circumstances can be negotiated with the EPA.

Importantly, the proposed closure design needs to align with any proposed later-use for the locality and as such the closure methodology, landform and materials used need to ensure this later-use will be supported.

The suggested headings for inclusion in a Closure Plan, under which varying levels of information may be provided, are as follows:

- Brief site history:
 - site location
 - site ownership and occupier details
 - locations of waste deposition
 - depth and volumes of waste disposed
 - methodology of disposal
 - types of waste disposed
 - operational timeframe
 - method of construction (eg of cells, trenches, engineering).
- Site information summary:
 - local geology
 - depth to groundwater
 - quality of groundwater
 - local topography
 - surface waters and channels
 - surrounding landuse including sensitive receptors.

Much of this information may be gained from site records of monitoring conducted, from regional bore networks, or from existing geological information.

- Site condition/general amenity

Exposed waste—the site may need to be shaped to cover exposed waste on site, or as necessary, site clean up may be required to remove residual exposed waste and litter to a suitable disposal facility.

- Post-closure use (refer Section 12 of guideline)

The proposed post-closure use of the site must be outlined in the closure plan.

The closure design will need to support the end use for the site. For example, council should consider whether the site will be revegetated and left as open land or used as waste transfer station.

Management of site hazards for ingoing use must also be considered including site access, security, fencing, OHS&W, signage, fire, amenity, vermin, ongoing monitoring and maintenance.

- Final shape (landform)

The final landfill shape must be compatible with the surrounding topography and land uses including post closure use of the facility.

Surface profile—work may need to be done to ensure there is a final surface contour that is suitable for the proposed end use, and has appropriate contours, stormwater shedding and runoff and erosion controls/detention ponds/swales to direct stormwater away from waste disposal areas. Usually EPA advises to ensure final slopes are no greater than 1 vertical to three horizontal units unless an alternative engineering design has been approved by the EPA depending on site specific circumstances.

- Hazards and loss of amenity

The closure plan must consider hazards and amenity issues. The plan must identify hazards and include management measures for these risks.

- Capping system

The landfill must be covered by a capping system that provides a long-term separation layer between the waste and the final surface, protects human health and the environment and is compatible with the intended post-closure use. Refer Section 9 of the guidelines.

Presence and nature of any cover already existing (type, thickness, method of placement, vegetation) should be assessed. A separation layer between the waste and the final surface is needed to protect human health and the environment and needs to be compatible with the intended post-closure use.

- Stormwater and erosion control

Stormwater management strategies must consider the following:

- *management of surface water on site and control and monitoring of off-site stormwater discharge*
- *erosion and sediment control along drainage lines, disturbed areas and soil stockpiles. This includes stormwater flow control, vegetation use, installation of detention ponds, minimal land disturbance and other temporary and permanent erosion protection measures.*

- Landfill gas management

The closure plan must consider management of landfill gas. Refer Section 8 of the guidelines.

In situations where there is a high potential for landfill gas generation operators should consider gas detection investigation that can be done/has been done to provide an indication of risk and thus if any control or monitoring will be required. Some older and smaller sites with low landfill gas generation potential, but some risk of emissions, may consider whether methane oxidation layers can be incorporated into the capping system for management of residual landfill gas. A gas distribution layer such as gravel, separated with a geotextile filter from overlying capping soil and compost that supports microbes in

order to oxidise methane into carbon dioxide could be considered. It is recommended that licensees utilise expertise of an experienced consultant in this area.

- Leachate management

The closure plan and capping design must include measures to limit the generation of leachate. It should also consider collection, storage and treatment systems to manage the leachate that is generated. Refer Section 6 of the guidelines.

Licensees should consider what information might be available from existing leachate sumps or groundwater bores. Many small sites will simply need to shape the waste disposal areas and apply a cover of soil and vegetation to minimize the potential for leachate generation by shedding water away from waste disposal areas.

- Termination of waste disposal

The plan must consider measures to provide sufficient notice to users of the site that the landfill will be closing and will no longer accept waste. Measures will also be required to prevent post-closure waste disposal or illegal dumping.

- Measures for post-closure management

Post-closure management must be addressed in a closure plan to ensure waste disposed at the site does not pose an unacceptable risk to the environment. Post closure monitoring in some form (for example of integrity of the cap and revegetation, stormwater, groundwater and landfill gas as applicable—depending on the site). The timeframe required for this may vary depending on the site specific risks.

The level of post closure management required will again be dependant on the age and status of the landfill. This section is aimed at best practice for current landfills. Older landfills may not be required to undertake the full extent of post closure management described in this section. Importantly, the proposed closure design needs to align with any proposed post-closure use for the locality and as such the closure methodology, landform and materials use needs to ensure this later-use will be supported.

7 TIMEFRAMES AND EXPECTATIONS FOR CLOSURE

Once a closure plan and post-closure management plan has been submitted to the EPA, it will be assessed and recommendations made to the landfill owner. If need be, an officer from the EPA will conduct a site visit in the company of the landfill owner. Any concerns that the EPA might have will be discussed during this site visit and/or followed up in writing and thus the landfill owner may be required to resubmit a final revised closure plan for approval.

For this reason, it is advisable to involve the EPA early in the process. Furthermore the EPA can receive draft closure plans to assist with progressing of development of a satisfactory plan. Given the timeframes for implementation and the potential need for amendments to plans prior to approval, it is recommended that for sites wishing to meet the timeframe of achieving an approved closure and post closure management plan prior to July 2008, submission of plans should occur no later than April 2008.

Once the EPA and the landfill owner agree on the closure plan and post-closure management, the landfill owner will then need to make arrangements for the closure works to start. The EPA encourages licensees to advise when closure works will be conducted to allow the opportunity for a site inspection to occur.

8 CONFIRMATION OF CLOSURE WORKS

The EPA will require a report to be submitted confirming that the closure works of the approved closure and post closure management plan have been implemented. The closure plan should include a commitment to produce such a report. This report should include sufficient information to demonstrate the closure works have been conducted in accordance with the approved plan. Information for inclusion in this 'as constructed report' should include a site and infrastructure plan, final contours, stormwater drainage, capping materials used, volumes and thicknesses, pictures of the capping works, details on construction methods and machinery, etc. The level of detail required may vary depending on the complexity of the site and further guidance can be sought from the EPA in this regard.

APPENDIX DEFAULT SUGGESTED STANDARDS FOR CLOSURE PRIOR TO 2010

Landfill type	In-situ waste (tonnes)	Description	Closure profile	Other measures
Small sites	Up to 500	Municipal solid waste	300 mm soil graded to shed water away from waste 300mm interim cover above waste	Interim cover used to cover exposed waste. Consider use of compost/mulch to assist in re-vegetation and erosion
Cells—SB—	<26,000	Small landfill with low potential to generate leachate, low risk of water flow into the waste, no disposal of waste with high moisture content and sporadic potential for leachate generation based on climatic conditions	300 mm soil compacted and graded to shed water away from waste 300 mm interim cover compacted above waste	Interim cover used to cover exposed waste. Consider use of compost/mulch to assist in re-vegetation and to prevent erosion
Cells—SB+	<26,000	Small landfill with high potential to generate leachate, and/or high risk of water flow into the waste, and/or disposal of waste with high moisture content and/or seasonal potential for leachate generation based on climatic conditions	300 mm top soil layer used as growing medium for vegetation 300 mm compacted and graded to shed water away from waste 300mm interim cover compacted above waste	Interim cover used to cover exposed wastes and provide separation layer between waste and final cap. Use compost/mulch to assist in re-vegetation and to prevent erosion. Must consider risk to groundwater and potential groundwater users; may require more stringent cap design.
Cells—MB—	>26,000 and <130,000	Medium landfill with low potential to generate leachate, low risk of water flow into the waste, no disposal of waste with high moisture content and sporadic potential for leachate generation based on climatic conditions	600 mm vegetation/soil top layer 300 mm soil compacted and graded to shed water away from waste 300 mm interim cover compacted above waste	Consider if groundwater monitoring is required, remove exposed waste, compost/mulch and re-vegetate to assist with prevention of erosion, consider risk to groundwater and potential groundwater users : more stringent cap design is required

Landfill type	In-situ waste (tonnes)	Description	Closure profile	Other measures
Cells— MB+	>26,000 and <130,000	Medium landfill with high potential to generate leachate, and/or high risk of water flow into the waste, and/or disposal of waste with high moisture content and/or seasonal potential for leachate generation based on climatic conditions	As per Landfill Guidelines	As per guidelines Groundwater monitoring Landfill gas monitoring and potential extraction
Cells— Large	>130,000	Large landfills have increased environmental management requirements by virtue of their size. These requirements exist independent of a site's potential for leachate generation	As per Landfill Guidelines	As per guidelines Groundwater monitoring Landfill gas monitoring and potential extraction

Notes:

- 1 For all classes of landfills, monitoring of the cap is recommended following heavy rains
- 2 The EPA requires documentation of the capping works, including photographs and material profiles above the waste.