

# Landfill licensing



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\*This is the final to the draft review 1619 issued April 2016

Guideline

**This guideline has been updated to provide supporting information for the introduction of the updated suite of landfill conditions rolled out as part of the periodic review of licences within EPA. This guideline should be used in preparing your annual performance statement. There is a summary of key changes from the previous version at the end.**

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## Introduction

EPA requirements for environmental management of landfill operations changed as part of the licence reform program, which commenced in 2010. These changes required licence-holders to better identify and manage the environmental impacts of their landfill operations. As part of the 2015/2016 review of landfill licences, conditions have been updated and new conditions developed. The focus of the changes has been to provide more clarity on EPA's expectations and enable an improved risk based approach to site-specific risks.

This document provides guidance to assist landfill operators and environmental auditors with ongoing environmental management of the landfill and with gaining EPA approval for construction of new landfill cells at existing landfills.

Section A outlines the steps to be taken by landfill operators during preparation of an environmental monitoring program and auditing of landfill operation.

Section B outlines the steps to be taken in obtaining EPA approval to design a new cell and in the preparing of the specifications for new landfill cells (including cap design).

Section C outlines the cell, cap and leachate pond construction, audit and licence amendment process.

Guidance is provided to environmental auditors for conduct of environmental assessments and audits during each of these components of landfill management. Guidance on potential conflicts of interest of environmental auditors is provided at the end of these guidelines.

Guidance on understanding landfill licence conditions is provided in Appendix 1. Further detailed technical information, including templates for notifications to EPA are provided in Appendices 2 – 20.

## Components of landfill licensing and management

Environmental management of landfill cells, for the purpose of these guidelines, falls into three main components:

- A. environmental monitoring and auditing of landfill operations
- B. cell design
- C. cell construction.

These components require the participation of the landfill licence-holder, environmental auditors and EPA. Details of these components and the roles of the respective parties are provided in the following sections of these guidelines. Post-closure landfill management is not addressed in these guidelines — see Best practice environmental management — Siting, design, operation and rehabilitation of landfills (EPA Publication 788; Landfill BPEM).

### A. Environmental monitoring and auditing

The environmental monitoring and auditing component of landfill management comprises:

1. risk assessment
2. environmental monitoring program
3. environmental audit program.

These three processes, described in more detail on the following pages, are interlinked and are each required to facilitate effective, risk-based environmental monitoring and auditing of landfill operations. The required approach to establishing the risk-based audit program follows and is shown in Figure 1.

Prior to commencing operation, an environmental monitoring program, based on a risk assessment of the landfill operations, must be prepared for the landfill. The environmental monitoring program must be verified by an environmental auditor.

After the initial verification, environmental monitoring program verification must be conducted as part of each environmental audit and confirmation of the verification provided in the subsequent annual performance statements.

In compliance with licence conditions L1 and L2, the licence-holder must implement the monitoring and audit program consistent with the verified environmental monitoring program (see Figure 1).

For construction of a new cell, the following steps are to be taken:

- a. During construction of the new cell, the licence holder must amend the risk assessment (RA) and monitoring program (MP) to include environmental risks and monitoring provisions for the new cell.
  - b. Incorporate into the RA and MP any relevant recommendations included in the construction audit report.
  - c. Finalise the RA and MP.
  - d. Continue with the operational landfill audit program consistent with the amended MP.
1. Risk assessment

An environmental risk assessment of landfill operations is required to identify and evaluate the potential risks of the operations to the environment. The risk assessment must be conducted in a rigorous and systematic manner. An example of a risk assessment method is provided in the Joint Australian/New Zealand Standard, AS/NZS ISO 31000:2009, Risk management — Principles and guidelines.

A risk assessment will have been conducted as part of preparation for the initial verification of the monitoring program. The licence-holder may elect to maintain a site risk assessment document (which will be the case until an audit has been conducted) or to use a risk assessment adapted from that documented by the environmental auditor. If a separate risk assessment document is maintained, the licence-holder must ensure that it is consistent with that prepared by the auditor.

## Scope

The scope of the risk assessment must be clearly defined prior to conducting the assessment and be tailored to enable use of the results for preparation of the environmental monitoring program.

The process must be sufficiently well documented to support the conclusions reached and to enable an independent person to understand and verify the process used.

## Periodic review

The risk assessment must be assessed by the auditor as part of each environmental audit. After each audit, the risk assessment must be updated to incorporate environmental audit findings or recommendations made by the auditor.

Where audits are two or more years apart, the risk assessment must be reviewed at least annually. An interim review must not exclude any items of significant risk identified by the environmental auditor.

Reviews of the environmental risk assessment must be conducted by a suitably experienced person. Each review must include consideration of monitoring results obtained, complaints received, changes to landfill activities, cell capping and progressive rehabilitation works, or changes to surrounding land uses or sensitive receptors that have occurred since the preceding review.

## Landfill gas

The environmental risk assessment may determine that generation of landfill gas at the premises presents an unacceptably high risk to the environment. Where this occurs, a specific landfill gas risk assessment should be conducted to more rigorously assess the risks associated with landfill gas. An indicative approach to a landfill gas risk assessment is provided in Appendix 2.

## 2. Environmental monitoring program

The licence-holder must prepare and implement an environmental monitoring program for the landfill based on the results of the risk assessment. The monitoring program must be verified by an environmental auditor. The monitoring program must, as a minimum, do the following:

- List the environmental elements to be included in the program. These must include groundwater, landfill gas, air and the land. The need for monitoring of landfill gas would be determined using a landfill gas risk assessment process described in Appendix 2.
- List parameters to be monitored — based on the risk assessment, waste received, nature of site operations and consistent with the listed environmental elements.
- Identify sampling point locations and associated sampling infrastructure and equipment and provide comment on the suitability of those locations.
- Specify sampling methods with reference to standards or procedures to be applied.
- For BPEM compliant lined cells, include a requirement for the maximum leachate head above the lowest point of the drainage layer in landfill cells to not exceed 300 mm.
- For all other cells, the required leachate head level needs to be determined from a hydrogeological assessment (HA).
- Where a HA has been conducted for the site, the monitoring plan must specify the requirement to maintain the leachate level for each cell below the levels specified in the HA. The environmental auditor will specifically assess this.
- Include a schedule of monitoring frequencies for sampling or testing of each parameter, with justification provided for the frequency adopted. This would include consideration of the age of the landfill, past monitoring results, data gaps and identified impacts on adjacent land or receptors.

The frequency of monitoring should be based on the recommendations of the risk assessment. EPA generally expects the default monitoring frequency to be quarterly, with the minimum frequency being half-yearly. Selection of a half-yearly monitoring frequency must be justified by reference to past monitoring results and the risk assessment.

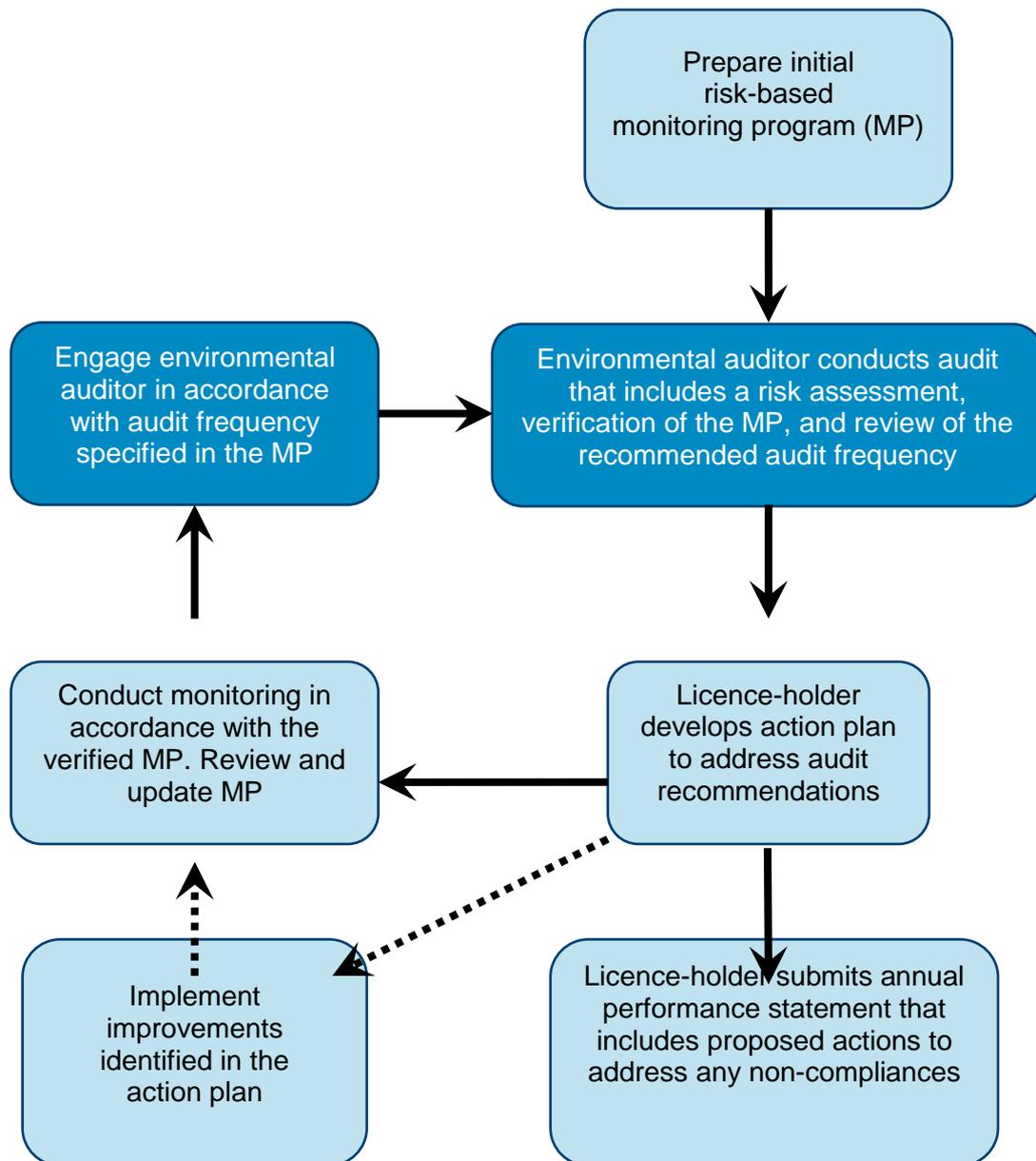


Figure 1: Risk assessment, environmental monitoring program and environmental audit cycle

- Specify required analysis method detection limits.
- Specify quality assurance requirements.
- Specify trigger levels for action for each of the parameters being monitored.
- Include a requirement for a section 53V environmental audit program and specify the frequency of the audits.
- The audit frequency should reflect the risk to the environment presented by operations at the landfill. For example, the audit frequency for high-risk landfills may be once every one or two years, while that for low-risk rural landfills may be once every three to five years. Appendix 3 describes the criteria for identifying low-risk rural landfills.
- Specify the method by which verification of capped cells against the approved EPA design will occur.

Parameters that may be included in an environmental monitoring program are identified in Appendix 4.

## Review and verification

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The licence-holder must monitor landfill operations in accordance with the monitoring program. Prior to the ensuing audit of landfill operation, the licence-holder must review and update the environmental monitoring program with regard to audit recommendations, past monitoring results, any direction by EPA and any changes to operations, the environment or receptors.

The environmental monitoring program must be verified by an environmental auditor as part of each environmental audit (see below).

The steps to be taken by an environmental auditor during verification of a monitoring program are listed in Appendix 5.

### 3. Environmental audit program

An environmental audit program must be developed and implemented to assess the risk of potential harm to the environment caused by operation of the landfill.

#### Conduct

The environmental audits must be conducted at a frequency that meets or exceeds that specified in the monitoring program and must address matters specified in these guidelines.

The audit program must comprise section 53V environmental audits conducted by an environmental auditor.

#### Scope

Appendix 6 specifies the required scope of each audit.

The audits must examine, at a minimum, all elements of the environment that may be subject to significant impacts from landfill operations and must include assessment of landfill gas and groundwater. The significant impacts should include those identified by the previously completed risk assessment. They may be supplemented by impacts identified by a risk assessment conducted by the environmental auditor.

Each audit must include a review of the completeness of the site risk assessment (landfill operation and landfill gas) and verification of the environmental monitoring program.

EPA approval of the audit scope is not required, provided the audit scope is consistent with that specified in Appendix 6 and the environmental auditor has a documented, detailed audit plan. EPA does not require submission of a courtesy copy of the audit scope. **Audit report**

All findings of the audit must be detailed in an environmental audit report prepared by the environmental auditor in accordance with EPA Publication 952.

The audit report must include a section that provides comment on the completeness and conclusions of the risk assessment and verification of the adequacy of the monitoring program. The recommendations provided in the audit report must be based on risk assessments and should be prioritised as defined in Table 1 below. Where necessary, the audit report may include recommendations for modification of the monitoring program.

**Table 1: Definition of priorities of auditor recommendation**

Priority	Definition
High	Requires immediate action to manage high environmental risk or mitigate high impact.
Medium	Requires prompt action (within six months) to manage moderate to low environmental risk or mitigate a moderate to low impact.
Low	Requires action prior to the next Landfill Operation Audit to manage a low environmental risk, or mitigate a low impact.

The audit report must also include a recommendation and provide justification for the frequency of subsequent environmental audits. This provides a feedback loop between the environmental monitoring and environmental audit programs. Where applicable, reference may be made to the low risk rural landfill criteria in Appendix 3.

#### Audit recommendations and licence-holder action plan

The licence-holder must prepare an action plan for implementation of audit report recommendations and promptly update the risk assessment and monitoring program accordingly.

Audit recommendations, licence-holder response and progress made will be reported as part of the annual performance statement.

## **B. Cell design and EPA approval**

Where a licence-holder has identified a need to construct a new landfill cell, the licence-holder must obtain written approval from EPA to:

- initiate the new cell design and approval process (Part B, points 4 to 10)
- commence construction of the approved landfill cell (Part C, points 11 to 16)
- commence filling of the newly constructed landfill cell (Part C, point 17).

EPA will not provide approval to initiate the new cell approval process or allow construction of a new cell if the licence-holder has failed to progressively rehabilitate existing cells. Compliance and environmental performance history will also be a key consideration.

This new cell approval process includes engagement of an environmental auditor to assess the plans, technical specifications and construction quality assurance plan (design documents) for the new cell. Figure 2 illustrates the approach to cell design and approval.

### **4. Identification of a need for a new landfill cell**

Once a need for a new landfill cell has been identified, the licence-holder initiates the approval process by notifying EPA of the intent to construct a new landfill cell and seek preliminary approval.

The notification must be supported by information such as rehabilitation of existing cells, current available air space and footprint and projected air space and footprint of the new cell, type of waste to be deposited in the cell, anticipated life of the cell and a pre-settlement contour plan of the entire landfill premises including the location of the proposed cell. Details of the required information are provided in Appendix 7.

Once notification has been received, EPA will assess the need for a new cell based on the information provided and knowledge of current operations.

Assessment criteria to be applied by EPA are identified in Appendix 8 and should be addressed when preparing the notification. EPA may either accept or reject the application at this point. It is anticipated that EPA will respond within 10 business days of receiving the notification.

### **5. Preparation of plans, technical specifications and construction quality assurance plan (design documents) for the new landfill cell**

The design documents may be prepared as a 'design report' by the licence-holder or a consultant engaged by the licence-holder.

While cell design includes cell capping, only basic capping design plans are required at this stage. This reflects the fact that cell capping design may change during the life of the cell.

Details of information to be included in the plans, technical specifications and construction quality assurance (CQA) plan are provided in Appendices 9, 10 and 11 respectively.

The landfill liner includes the floor, the side walls and the cap. In broad terms, the landfill liner means the barrier system, leachate collection system (i.e. drainage layer with pipes etc.) and associated cushion and separation/filter layers.

Where existing cells do not comply with the Landfill BPEM, all new adjoining cells must include a separation between the two cells. This may require allowance for separation from the sides and laybacks of the existing cells. Slope stability information must be submitted with new cell designs if the side wall slope is steeper than 3:1 (horizontal to vertical) or any other situation where slope stability is in question.

As a minimum, the plans, technical specifications and the CQA plan must meet the requirements of the Landfill BPEM. Where the plans, technical specifications or CQA plan vary from Landfill BPEM requirements, the document must include justification for the use of that alternative. If the landfill is deemed to be a low-risk rural landfill based on criteria outlined in Appendix 3, evidence must be provided to support each criterion. The final decision of the determination to be a low risk rural landfill rests with EPA.

In all cases, it must be demonstrated that the selected construction material and/or method would provide equivalent or better environmental protection to meet the outcomes specified in the Landfill BPEM.

#### **Hold points**

The CQA plan must specify hold points at which the environmental auditor engaged to audit cell construction would inspect and verify the landfill construction works.

Typical construction hold points are identified in Appendix 12. These may be varied at the discretion of the environmental auditor.

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Where hold points are specified, approval to commence the subsequent works is required from the environmental auditor. The environmental auditor may nominate additional hold points to facilitate auditing of cell construction. These would be agreed with the licence-holder during planning of the construction works.

## 6. Assessment of the plans, technical specifications and CQA plan (design documents)

The licence-holder must engage an environmental auditor to assess the completeness of the specifications (including basic cap design) and CQA plan with reference to the Landfill BPEM, applicable state environment protection policies (SEPPs) and other relevant standards.

(Note that this assessment does not constitute an environmental audit.)

For the purposes of the assessment, the plans, technical specifications and CQA plan must include items identified in Appendices 9, 10 and 11, and may be submitted in a 'design report'.

The design report must contain all of the information required by an auditor to conduct their assessment and allow them to complete the assessment declaration. A typical table of contents for landfill cell design reports as developed by the landfill operations auditor working group is provided in Appendix 13.

Variations of construction requirements in the technical specifications or CQA plan from Landfill BPEM requirements must be justified in the document, along with an assessment of the landfill in meeting low risk criteria, if applicable.

The assessment requires the environmental auditor to declare in writing that the plans, technical specifications and CQA plan contain sufficient information of a suitable quality to demonstrate that construction of the landfill cell would meet the Authority's requirements. The required scope of the assessment is specified in Appendix 14.

The same review and approval process will apply for the construction of leachate ponds.

The environmental auditor is not required to notify EPA of the engagement to conduct the assessment. EPA approval of the assessment scope is not required provided the scope is consistent with that specified in Appendix 14 and a detailed assessment plan has been prepared by the environmental auditor.

## 7. Refinement of the plans, technical specifications and CQA plan prior to environmental auditor sign-off

Depending on the findings and recommendations of the environmental auditor, the plans, technical specifications or CQA plan may require amendment.

Once the plans, technical specifications and CQA plan are acceptable to the environmental auditor, the environmental auditor will issue an assessment declaration.

The assessment declaration should use the wording provided in Appendix 15.

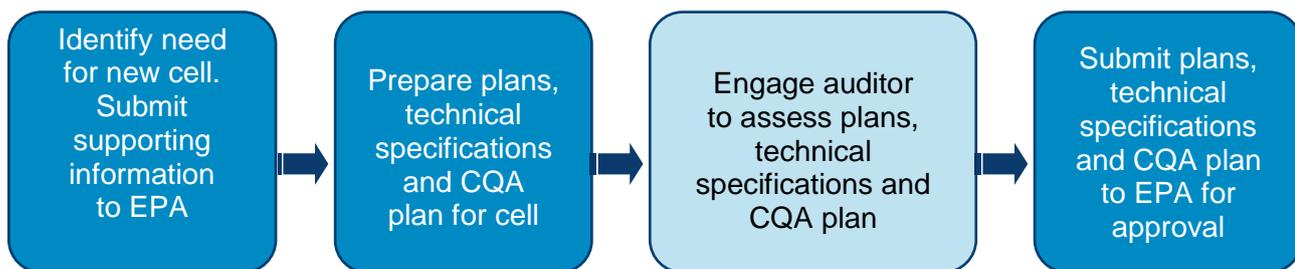


Figure 2: Process for preparation of plans, technical specifications and CQA plan for cell approval

## 8. Submission of plans, technical specifications and CQA plan to EPA for approval

Once the documents have been assembled, the licence-holder may submit a design report containing the plans (including cell capping), technical specifications, CQA plan and environmental auditor declaration to EPA for assessment.

The format of the submission letter is provided in Appendix 16.

EPA will provide written acknowledgement of receipt of the submission within five business days.

## 9. Assessment of submission by EPA

The assessment period will start on receipt of the submission by EPA. The period of time for assessment of the submission by EPA is set at a maximum of 20 business days.

Appendix 17 lists assessment criteria to be used by EPA.

## 10. Notification to licence-holder of EPA decision

If the application is accepted by EPA, EPA will notify the licence-holder in writing that construction of the new landfill cell may commence. If the application is not accepted, EPA will provide reasons for the non-approval.

EPA may attach conditions to the approval letter.

## C. Cell construction

The third component of cell approvals, design and management process is construction of the new landfill cell. This component requires close involvement of an environmental auditor, who will be auditing and verifying the cell construction.

Specific steps within the cell construction component are described below and shown in Figure 3.

## 11. Engagement of environmental auditor

Prior to commencing construction, the licence-holder must engage an environmental auditor to conduct a section 53V environmental audit of compliance of construction with the requirements of the EPA-approved technical specifications and CQA plan.

The minimum scope of the cell construction audit is provided in Appendix 18.

The scope must also consider any conditions included in the approval letter provided by EPA. Provided the audit scope is consistent with that specified in Appendix 18 and the environmental auditor has prepared a detailed audit plan, EPA approval of the audit scope is not required.

Construction hold points should be agreed between the environmental auditor and the licence-holder during audit scoping.

The environmental auditor must not act in a supervisory (or advisory) role at the subject landfill during construction. Monitoring and testing activities conducted by the audit team as part of the construction audit are regarded by EPA as supporting work for the audit.

## 12. Audit of cell construction by environmental auditor

The environmental auditor is to audit the construction works in accordance with the audit scope. The environmental auditor may elect to conduct site inspections additional to the identified hold points and would arrange these with the licence-holder to coincide with certain construction activities.

The audits will need to include construction works associated with cell wall lifts. Requirements for these are specified in section 16 below.

All findings of the audit, including the CQA results obtained at each of the hold points, must be described in an audit report to be prepared by the environmental auditor, which is consistent with EPA Publication 952.

The environmental auditor may specify in the audit report recommendations for inclusion of particular monitoring requirements in the monitoring program to be developed for operation of the landfill cell.

A copy of EPA approvals for construction variations (see below) must be attached to the audit report.

The same construction audit process will apply for leachate ponds.

## 13. Variations from the proposed technical specifications

Variations during cell construction may arise due to unforeseen events, such as accessibility of certain construction materials, improvement in available technology or unforeseen ground or geotechnical difficulties.

Criteria for determining whether a variation is 'major' or 'minor' are provided in Appendix 19.

The licence-holder, in consultation with the landfill cell designer, is responsible for determining whether a variation is major or minor. Where there is doubt regarding classification of a variation, the precautionary principle should apply and the variation be regarded as major and treated accordingly. Advice from EPA may be sought to assist with this determination.

### Major variation

Where a major, unapproved variation arises, the licence-holder must cease construction of the affected part of the cell and inform both EPA and the environmental auditor in writing. The licence-holder must apply in writing with an endorsement from the auditor to EPA for approval of the variation before restarting construction. The environmental auditor does not have authority to approve a major variation.

Where an environmental auditor identifies a major, unapproved variation during inspection of the construction works, the environmental auditor must inform the licence-holder of the identified variation. In such an instance, the licence-holder must cease construction and inform EPA in writing. The licence-holder must then seek approval from EPA for the variation and not recommence construction until approval has been granted. Depending on the scale of the variation, approval by EPA will be within 20 business days.

In considering the variation, EPA may require the licence-holder to commission an independent assessment of the risk to the environment presented by the variation. This risk assessment may be conducted by the existing environmental auditor.

The environmental auditor may address a variation that arises after completion of an audit report for an earlier stage of construction in an addendum report.

## Minor variation

Where a minor variation arises, the licence-holder must inform the environmental auditor in writing.

EPA approval of a minor variation is not required and notification of EPA of the variation is at the discretion of the licence-holder.

The environmental auditor must conduct a risk assessment of the minor variation as part of the audit process. Where the environmental auditor determines that the variation does not present a significant environmental risk, the minor variation may be incorporated into the construction and include in the audit report. Where the environmental auditor determines that the variation does present a significant environmental risk, the variation may not be incorporated into the construction works.

Where there are multiple minor variations, the auditor must assess the variations as a whole to avoid 'minor variation creep'. Where the auditor considers that, collectively, the minor variations may constitute a major variation, the auditor must advise the licence-holder of the view.

The licence-holder must notify EPA of the variation and the auditor's findings. The licence-holder must also provide EPA with a proposed plan on how the variation will be managed.

## 14. Licence-holder to submit audit report to EPA

Once construction of the new landfill cell has been completed, the audit must be finalised and the audit report provided to the licence-holder. The environmental auditor must also provide a copy to the Environmental Audit Unit at EPA as part of the Auditor's administrative requirements of their appointment.

, The licence-holder must submit directly to EPA:

- a copy of the audit report
- a list of environmental auditor recommended actions suitably phrased for inclusion in the environmental monitoring program or any additional work
- an application for amendment to the licence to include the landfill cell and associated details
- an updated site plan (see Appendix 7 for details of information to be included in the plan)

The documentation outlined above should be submitted to the approval applications mail box at [approvals.applications@epa.vic.gov.au](mailto:approvals.applications@epa.vic.gov.au)

For documents too large to email a hard copy or flash drive can be sent to:

Development Assessments Unit  
Environment Protection Authority Victoria  
GPO Box 4395  
Melbourne 3001.

## 15. Review of audit report and licence amendment application by EPA

The audit report, with any variation approvals and associated documentation submitted with the report, will be reviewed by EPA. The assessment time available to EPA is up to 20 business days from receipt of the submission.

## 16. Where walls of a cell are designed to be constructed in more than one lift

Some landfill cells are designed so that the walls (side wall or separation walls), in particular the drainage layer, are constructed in a series of individual lifts. In such cases, steps 11 to 15 must be followed. The following requirements are specific to such cases:

- An environmental auditor must audit the construction of each subsequent lift
- The audit scope must reflect the staged approach for construction of the whole cell. The environmental auditor is not required to submit a separate scope for each lift
- The environmental auditor must complete an addendum to the audit report for construction of each lift
- The landfill operator must submit a copy of the addendum to EPA

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- Where more lifts are to be constructed, the landfill operator must send a letter with the addendum detailing the expected starting date for construction of the next lift
- The landfill operator must obtain written approval from EPA before starting to fill each lift. The time period for assessment of the application for approval to commence the lift is set at a maximum of ten business days from date of receipt.

## 17. Issue of amended licence by EPA

Once satisfied that all approval requirements for construction and use of a new landfill cell have been met, and there are not any issues with the submission, EPA will approve use of the new cell. EPA will do this by issuing a licence in which the premises plan and Schedule 2 have been amended to include the new cell and the type and quantity of wastes that may be deposited in the cell.

Issue of the amended licence would be subject to receipt and acceptance of an environmental auditor declaration for the environmental monitoring program that includes the new cell.

Preparation of the monitoring program may be scheduled to coincide with completion of the cell construction and receipt of the audit report so that any environmental auditor recommendations may be included in the program.

## 18. Cell capping system

Design of the capping system is part of the overall landfill cell design and is subject to the approval process that applies to other components of the landfill cell (basal liner, side liner, leachate collection system etc.).

This means that the final design, technical specifications and construction quality assurance plan for the final landfill cap must be endorsed by an environmental auditor prior to submission for EPA approval. Where EPA has already approved the cap design and material specifications as part of a new cell approval process and that design is still intended to be used, the auditor need only endorse the construction quality assurance plan.

Construction of the landfill cap should be audited by an environmental auditor (similar to the construction of a landfill base and side walls).

The requirement for design endorsement and construction certification by an environmental auditor may be waived by EPA for low risk rural landfills depending on site characteristics and the level of complexity (Chapter 6.12 BPEM).

## 19. Leachate pond construction

The leachate pond and associated infrastructure (such as connecting pipes, conveyance structures etc.) is subject to the same approval process as for new landfill cells. The designs for the ponds and associated structures need to be prepared and approved by EPA prior to the start of construction, construction needs to be audited by an environmental auditor and EPA approval is required prior to its use. The approval process is explained in Sections B and C of this guideline.

## Annual performance statement

In accordance with licence requirements and the details of EPA Publication 1320, Annual performance statement guidelines, the licence-holder is required to complete and submit to EPA an annual performance statement (APS).

### Additional information for landfill operators

In addition to any other APS requirements, the licence-holder must:

- confirm that the environmental monitoring program has been verified by an environmental auditor
- confirm that the environmental monitoring program has been revised and implemented in accordance with the verified timetable
- provide priorities of recommendations provided by environmental auditor
- provide status of implementation of environmental auditor's recommendations
- confirm that any environmental auditor recommendations have been implemented
- confirm whether a landfill operations audit has occurred in the previous period
- provide estimates on waste received in the financial year, including category B and C wastes where applicable
- provide the outcomes of the independent annual survey, specifically identifying remaining air space.

### Independence of environmental audit program

Submission of the APS is independent of the environmental audit program.

The statement of compliance should be based on monitoring results and other information obtained during the previous financial year.

The purpose of each environmental audit is to assess the interpretation of monitoring results made by the licence-holder and to provide recommendations for future monitoring and the frequency of the audit program. It is not intended diminish the monitoring responsibilities of the licence-holder.

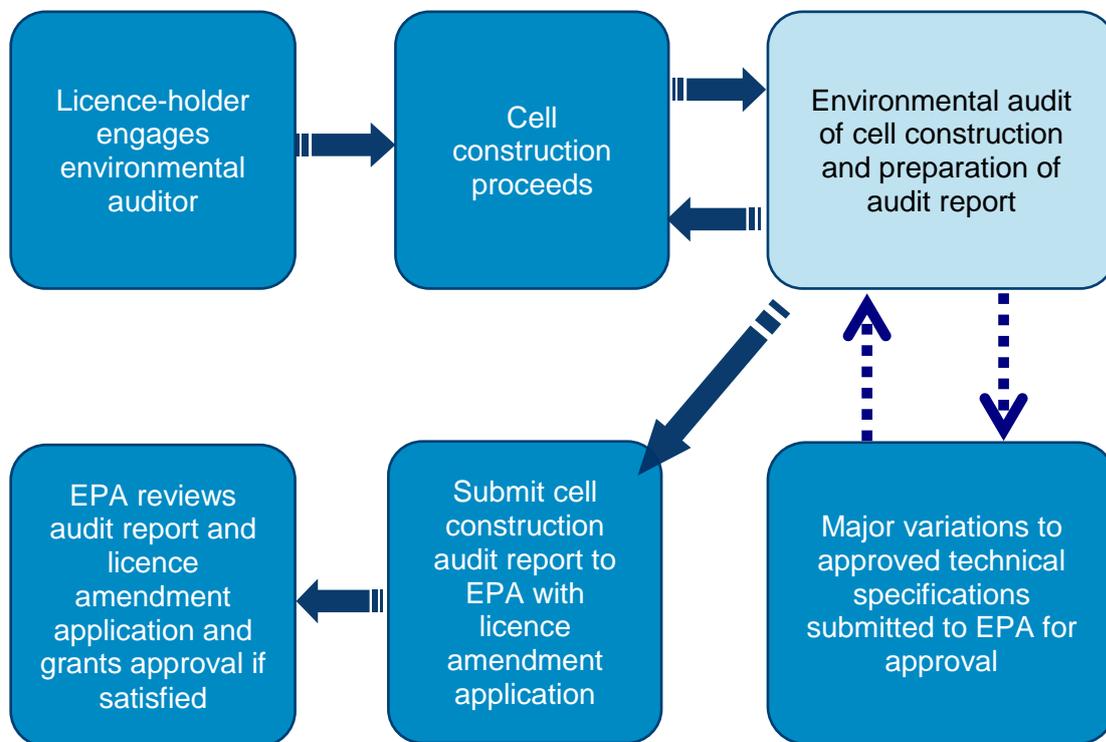


Figure 3: Process for audit of cell construction

## Avoiding environmental auditor conflict of interest

As described in the previous section, the landfill cell licensing and management process falls into three main components:

- A. environmental monitoring and auditing of landfill operations
- B. cell design
- C. cell construction.

There is a potential for real or perceived conflict of interest to arise when one environmental auditor is involved with all of these components. Guidance on avoiding a conflict of interest is provided below.

As a rule of thumb for avoiding a conflict of interest an environmental auditor involved in either one or both of the cell design and cell construction components may not be involved in verification of the monitoring program or the subsequent auditing of the landfill.

If an environmental auditor intends to conduct an environmental audit of landfill operations, the auditor or their company must not have been involved in the development of the risk assessment unless done as part of an environmental audit.

If an environmental auditor or their company has had significant involvement in the development of a landfill monitoring program, the auditor must consider actual or perceived conflicts prior to conducting an audit of landfill operations. The potential conflict of interest in this instance arises if the auditor were to assess their own monitoring program.

As EPA approves the cell design, an environmental auditor may assess a design developed by their company and subsequently audit the EPA-approved technical specifications and CQA plan (i.e. conduct a cell construction audit).

Where the licence-holder or environmental auditor has a particular concern regarding conflict of interest, further guidance may be sought from EPA.

## Appendix 1: Understanding landfill licence conditions

### A1.1 Introduction

The following information about the licence conditions for landfills is designed to assist you (the licence-holder) in understanding and managing your licence.

Refer to EPA Publication 1322 Licence Management Guidelines to find information on other conditions that may be applicable to your licence.

The information will help you understand your licence conditions, their intent and the things you should consider in how to comply and how to demonstrate compliance. It also provides references to other documents where you can find more information.

In some cases, additional conditions may be applied in relation to a specific licence aspect. The duties and obligations imposed by these conditions do not derogate from each other and it is required that you comply with all licence conditions applied to your licence.

Due to the phased nature of landfill cell operations, it is understood that the conditions relating to cell construction, cell design, cell audit, cell approval, intermediate cover, cap design, cap auditing and closure may not be applicable to your licence in every year of operation, particularly if your site is in the process of ceasing operations. Where a landfill condition is on your licence but has not been applicable to your site in the APS submission period, it may be answered as “Yes” in the statement of compliance.

Certain conditions on your licence may require you to seek a further approval from EPA. These approvals can be sought via written application, quoting the licence number in all correspondence to:

approvals.applications@epa.vic.gov.au

Please note that this guideline is for explanatory purposes only and is generic in nature. It does not provide legally binding instructions.

### A1.2 Landfill management conditions

#### A1 Odour

*You must ensure that odours offensive to the senses of human beings are not discharged, emitted or released beyond the boundaries of the premises.*

This condition is in line with the required outcome of the Landfill BPEM to prevent any offensive odours beyond the boundary of the premises.

Depending on the site setting, operational practices and compliance history, EPA may include one or more licence conditions to regulate odours from landfill premises so that they do not impact occupants of residential or other sensitive land uses.

These conditions aim to ensure that the local community is not adversely affected by odour generated by onsite activities. ‘Offensiveness’ is generally influenced by the type and strength of the odour, as well as how often a person is exposed to it.

To find out more information on how to show compliance with these conditions, refer to EPA Publication 1322.

#### A2 Noise

*You must ensure that there are no emissions of noise and/or vibrations from the premises, which are detrimental to either of the following:*

- a) *the environment in the area around the premises; and*
- b) *the wellbeing of persons or property in the area around the premises.*

This condition is in line with the required outcome of the Landfill BPEM which requires landfill licence holders in the Metropolitan area to comply with noise limits prescribed by SEPP (Control of Noise from Commerce, Industry and Trade) No. N-1 1989 and for landfill licence holders outside of the Melbourne metropolitan area to comply with noise guidelines issued by EPA. Depending on the site setting, operational practices and compliance history, EPA may include one or more licence conditions to regulate noise and vibration from landfill premises so that they do not impact occupants of residential or other sensitive land uses.

To find out more information on how to show compliance with these conditions, refer to EPA Publication 1322.

#### A3 Dust and Airborne particles

*You must ensure that nuisance dust and/or nuisance airborne particles are not discharged or emitted beyond the boundaries of the premises.*

The required outcome of the Landfill BPEM is to control all dust emissions from the landfill site.

Depending on the site setting, operational practices and compliance history, EPA may include one or more licence conditions to regulate dust and airborne particles from landfill premises so that they do not impact occupants of residential or other sensitive land uses.

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Landfills are considered to be high risk premises in relation to dust and airborne particles.

To find out more information on how to show compliance with these conditions, refer to EPA Publication 1322.

## L1 Monitoring program

*You must develop and put into place a monitoring program that accords with Section 2 of the Landfill Licensing Guidelines, (EPA Publication 1323). The program must evaluate the risks to the environment associated with the operation of the landfill and the steps, which can be taken to manage such risks and enable both you and EPA to determine changes in the condition of the environment or impacts to environmental quality as a result of activities at the premises. The monitoring program must be verified by a person who has been appointed as an environmental auditor under the Environment Protection Act 1970 and it must do all of the following:*

- a) *contain an assessment of the risks to the environment arising from the waste that has been deposited at the premises and of the current landfill operation prepared in accordance with the Landfill Licensing Guidelines, (EPA Publication 1323) or another method approved by EPA;*
- b) *describe the environmental monitoring of landfill gas, leachate, groundwater, land, air, odour, noise, dust and surface water which will be undertaken to respond to the risks identified in the risk assessment in paragraph a) above;*
- c) *contain trigger levels and contingency actions to prevent further pollution when exceeded;*
- d) *specify the frequency for completing environmental audits of the landfill operation;*
- e) *be appropriate and adapted to the characteristics of the landfill, including the landfill design, the volume of waste received, the age and planned future lifespan of the landfill and the surrounding environment.*

You are required to develop and put into place an environmental monitoring program and have it verified by an environmental auditor appointed under section 53S of the Act.

Preparation of a verified monitoring program is a required outcome of the Landfill BPEM.

The monitoring program must be based on the results of a risk assessment which is to be undertaken using existing monitoring results and audits (in accordance with Section A of this guideline). The risk assessment must take into account the requirements of the licence and relevant regulatory controls for example the Waste Management Policy (Siting, Design and Management of Landfills) (Landfill WMP), State Environment Protection Policy, Groundwaters of Victoria (SEPP GoV) and any of the Landfill BPEM required outcomes which are not part of a specific licence condition.

The monitoring program must be verified by an environmental auditor commissioned by you. This verification can be at any time, however it must occur as a component of each landfill operation audit (an environmental audit report issued in accordance with section 53V of the Act). The Auditor's assessment of the monitoring program must verify that the program is sufficiently rigorous to monitor all significant potential environmental impacts of landfill operations. It must also measure the magnitude of those impacts and subsequently demonstrate compliance with the licence conditions and contain a site-specific environmental management procedure to manage key risks and provide for contingencies.

The monitoring program should specify the frequency that environmental audits must be completed at the site.

A list of environmental auditors and further information in relation to environmental auditing is available from the EPA website.

### L1.1 Monitoring Program – specific monitoring

*The monitoring program must include environmental monitoring of [placeholder – environmental segment/process] in addition to the monitoring prescribed in Condition LI\_L1.*

EPA may include, where applicable, a licence condition that prescribes a specific type of monitoring depending on the operations at your site. This will usually be in response to a risk identified at the premises and is not covered by the general condition wording (for example in the event that regular asbestos air monitoring is required).

## L2 Environmental auditing

*You must engage a person who has been appointed as an environmental auditor under the Environment Protection Act 1970 to conduct and submit to EPA environmental audits of the risk of harm actually or potentially arising from landfill operation under section 53V of the Act at the frequency specified in the monitoring program.*

An integral part of the environmental monitoring of landfill operations is the engagement of an environmental auditor to independently assess any potential risk of harm arising from the operation of the landfill by preparing an environmental audit report in accordance with section 53V of the Act and the guidelines for such reports (EPA Publication 952). The audit report must also conclude whether the monitoring program is sufficient to enable the licence holder to demonstrate compliance or needs revision. The auditor must also review and confirm whether the licence holders' risk assessment used to design the monitoring program is sufficient and make conclusions and recommendations accordingly.

The licence-holder is responsible for engaging the auditor to conduct the audits required by these guidelines and must also take responsibility to implement any recommendations the auditor makes.

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The required frequency of the audits will have been initially specified in the monitoring program prepared by you and verified by an environmental auditor. As part of the audit process, the auditor will review your monitoring program and recommend a frequency for subsequent audits. This frequency would reflect, among other things, the environmental risks presented by the landfilling operations and the level of activity at the landfill.

Once the audit cycle has become established and if it is less frequent than annual, it is advisable to engage the auditor annually to review progress towards implementation of any recommendations in any previous environmental audit report. This could result in further interim advice (letter signed by the auditor in their statutory capacity) and recommendations by the auditor. These should also be reported in the APS.

## L3 Surface Water Segregation

*You must ensure that surface water is segregated from active landfill cells.*

It is a required outcome of the Landfill BPEM that segregation of stormwater, leachate and groundwater is maintained at the landfill site.

Compliance with this can be achieved by:

- using drains or bund walls to direct clean stormwater away from the landfill activities
- design drainage measures to contain and control rainfall run-off for a 1 in 20 year storm event for a putrescible landfill or 1 in 10 for a solid inert landfill
- manage water from vehicle-washing areas (manual or automatic) as leachate
- use interceptor drains to intercept surface water or shallow groundwater.

It is acknowledged that it is not feasible for all surface water to be completely directed away from the active landfill cell particularly in steep terrains. All practicable measures should be taken to divert surface water away from the landfill cell.

It is also not the intent of this condition to include isolated incidences of water ponding on the landfill after high intensity rainfall events.

## L4 Leachate containment

*Waters contaminated by leachate must not be discharged beyond the boundaries of the premises.*

NB: This condition refers to leachate containment rather than protection of groundwater, which is addressed by standard condition DL1.

One of the most critical components of environmental protection at a landfill is the effective management of leachate. It involves a substantial investment in infrastructure during cell construction and in ongoing monitoring and management during the life and after closure of the landfill.

Leachate has a high potential to contaminate groundwater and to contaminate surface waters once collected and held in surface infrastructure. Leachate management at the landfill must have regard to minimising the potential for contamination of waters by leachate and avoiding discharge of any contaminated waters from the premises. From a regulatory context, leachate from a landfill must not have an impact on beneficial uses of surface waters.

Contamination of the surrounding environment by leachate is likely to represent a significant risk. Leachate management is therefore a key consideration in your monitoring program and will be a focus of environmental auditors.

EPA has previously used existing conditions L4.1 (300 mm leachate level) and L4.2 (inward gradient) to manage leachate levels at certain sites. These conditions will remain in place until a site derives cell/site specific leachate extraction levels. Going forward, EPA will continue to apply L4.1 (300 mm leachate level) condition for all BPEM compliant lined cells and a new condition L4.3 applied to sites requiring a hydrogeological assessment (HA) to define site and cell specific leachate levels for non BPEM compliant cells or if the landfill comprises one single tipping area, the entire premises.

### L4.1 Leachate management

*You must extract leachate from cells [place holder] such that the depth of leachate above the lowest point of the drainage layer does not exceed 300 millimetres.*

This condition both protects groundwater from high rates of leachate seeping through the landfill liner and ensures any landfill gas extraction systems can collect landfill gas from throughout the entire waste mass.

If this condition is attached to your licence, it is your responsibility to ensure that the level of leachate within the specified landfill cells is minimised. Leachate must be managed to prevent it from rising to a level more than 300 mm above the lowest point of the drainage layer. Regular surveillance of leachate levels must be included in any monitoring program.

For sites which do not have an existing leachate level management condition and which have unlined and partially lined landfills or cells which are not constructed to the standards of the Landfill BPEM, EPA will not use the licence condition L4.1. For such sites, (depending on site characteristics) maximum leachate level at or below which leachate must be managed, must be specified using

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a HA (see Condition L4.3). EPA expects that each new landfill cell is constructed with a dedicated leachate sump to ensure that leachate is appropriately managed.

## L4.2 Leachate management (inward gradient)

*You must ensure that leachate levels within the landfill cells are maintained at least one and a half metres lower than the local groundwater level as measured at the nearest downgradient bore.*

If this condition is attached to your licence i.e. for those landfills located within the watertable, leachate from cells without a leachate drainage layer is to be controlled by maintaining an inward hydraulic gradient. For these landfills, the actual level at which leachate is to be maintained is based on a hydrogeological assessment including an assessment of the practicality of extracting leachate, minimising the threat of groundwater contamination and maximising the potential to extract landfill gas.

## L4.3 Leachate management (hydrogeological assessment)

*By [placeholder – date] you must provide to EPA a hydrogeological assessment for the premises that:*

- a) is in accordance with Hydrogeological Assessment (Groundwater Quality) Guidelines (EPA Publication 668);*
- b) specifies the maximum leachate management level for [all unlined and partially lined cells OR the premises] which protects beneficial uses of groundwater and allows for the effective management of landfill gas; and*
- c) is verified by a person who has been appointed as an environmental auditor under the Environment Protection Act 1970.*

Section 39 (1) (e) of the Environment Protection Act 1970 requires that a person shall not pollute any waters (including groundwater) so as to make them detrimental to any beneficial use. The protected beneficial uses of groundwater are stated in the State Environment Protection Policy Groundwaters of Victoria (SEPP GoV). SEPP GoV states (Clause 12) that all practicable measures must be undertaken to prevent pollution of groundwater. Clause 16 states that EPA may require a hydrogeological assessment (HA) to be undertaken for the development of and assessing compliance with licence conditions.

You are required to specify the maximum leachate management levels in unlined or partially lined landfills or cells by undertaking a HA. The HA must determine leachate levels which protect or restore the protected beneficial uses of the groundwater hydraulically down gradient of the landfill.

The HA is undertaken by first producing a robust conceptual model of the site which includes, but is not limited to, wastes deposited, leachate composition, leachate depth, site engineering, hydrogeological setting, geological setting, bore log data, hydrological setting, groundwater quality, groundwater beneficial uses and the potential for their realisation. The HA can be undertaken with numerical models and the aid of computer based models.

Developing a conceptual site model and the subsequent HA is an iterative process, with the model and HA being reviewed and updated as new information becomes available (for example monitoring data) or as understanding of the system improves. Guidelines on completing a HA can be found in EPA Publication 668. The UK Environment Agency guidance document LFTGN 01 Hydrogeological Risk Assessments for Landfills also provides advice.

It should be noted that when setting leachate levels, which are protective of the beneficial uses of groundwater, the current and future gas extraction needs of the site must be considered. This means that leachate levels should be managed to protect or restore beneficial uses of groundwater and allow effective management of landfill gas. When leachate levels are too high the slotted sections of landfill gas wells become flooded, preventing effective extraction and landfill gas pressure can increase within the waste due to the piston effect of rising leachate levels. This typically results in landfill gas migration via the sub-surface geology or landfill surface.

It should be noted that a HA is ultimately required as a condition of a site post closure pollution abatement notice (PCPAN).

## L4.4 Leachate Management (extraction)

*You must extract leachate from [cell(s) XYZ OR the premises] such that the leachate level does not exceed [depth, m] AHD.*

Once a leachate level is obtained from the HA for each cell or the premises, it is your responsibility to extract leachate from the landfill or cells to ensure leachate levels are managed below the maximum leachate level specified in the HA. This may require installation of infrastructure for leachate extraction, transmission, storage, evaporation, discharge and sampling and level monitoring.

Regular monitoring of leachate levels is essential in demonstrating compliance with this licence condition.

The measured leachate level should be expressed in monitoring reports as metres above the Australian Height Datum (mAHD). In order to measure this, you will need a surveyed reference point in mAHD, typically this is the top of the leachate sump liner from which the depth measurement is taken. Care must be taken to survey the monitoring locations regularly to account for changes in height due to waste placement or waste settlement or physical changes to the monitoring location.

## L4.5 Leachate Management (ongoing hydrogeological assessment)

*You must review and update the hydrogeological assessment for the premises every 5 years after [date - original HA date] and provide to EPA.*

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The HA must be reviewed every 5 years. Since the HA is reliant on the conceptual site model (CSM), the CSM should be reviewed and updated also.

The review should, as a minimum, consider the following:

- waste composition
- local weather station data for the review period and long term trends
- groundwater quality and level
- surface water quality
- leachate quality and level
- landfill gas monitoring
- changes to beneficial uses of groundwater (i.e. land use change has made additional protected beneficial uses of groundwater relevant)
- capping and / or intermediate cover in use across the site

The information used in the review is that gathered since the previous HA. The purpose of the review is to assess whether any changes to leachate management and monitoring are required to protect or restore beneficial uses of groundwater.

Sufficient monitoring data should be available via the auditor verified monitoring program and audits undertaken at the site.

## L5 Landfill gas management

*You must take all practicable measures to prevent emissions of landfill gas from exceeding the action levels specified in Table 6.4 of Best practice environmental management, siting, design, operation and rehabilitation of landfills' (EPA Publication 788).*

It is a required outcome of the Landfill BPEM to undertake a site-specific landfill gas risk assessment and to take all practicable measures to achieve the landfill gas action levels detailed in Table 6.4 of the Landfill BPEM.

If landfill gas monitoring shows that the action levels have been exceeded you must:

- take action to reduce emissions to within the landfill gas action levels;
- notify EPA of the exceedance within 24 hours (in line with required outcomes and instructions in BPEM and the guidance in the Landfill Gas Fugitive Emissions Monitoring Guideline); and
- provide to EPA, and implement, a landfill gas remediation action plan (as per the required outcomes of BPEM).

Not taking all practicable measures to control and manage landfill gas emissions to within the gas action levels, not notifying EPA within the prescribed timeframe and not providing and implementing a landfill gas remediation action plan are considered to be breaches of this licence condition.

Fugitive landfill gas emissions can present a hazard to people and the environment. Landfill gas also contains many odorous trace gases which can cause significant degradation of amenity values of nearby residential and industrial / commercial land uses. Landfill gas is comprised of 98-99% methane and carbon dioxide. Methane is flammable and explosive between 5-15 % v/v. Both methane and carbon dioxide are asphyxiants and will displace oxygen in enclosed spaces including buildings. Landfill gas can adversely affect vegetation and crops when it moves through soils, it will also change groundwater chemistry if dissolved in aquifer water. Management of landfill gas at landfills is required to reduce the risks of the hazards and amenity impacts presented by landfill gas being realised at human and environmental receptors.

The BPEM gas action levels are reflective of the concentrations at which hazards are presented by landfill gas and are an early warning of when action must be taken to reduce emission. The gas action levels apply at the landfill boundary so that action is triggered before a sensitive receptor is impacted.

You must take all practicable measures to manage landfill gas to meet the BPEM gas action levels. Examples of practicable measures include, but are not limited to:

- installing and running a landfill gas extraction system
- regular balancing of landfill gas extraction wells, a minimum frequency of monthly is required, unless balancing records show longer stability trends at specific wells
- extraction of leachate such that it is managed to a maximum level in the waste which keeps the landfill gas extraction wells unsaturated
- application and maintenance of intermediate cover and final capping layers to allow sufficient vacuum to be applied to landfill gas extraction wells

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- progressive installation of the landfill gas extraction system when each completed cell is rehabilitated. In most cases it is observed that intermediate cover is used for a period of 1-2 years before a final cap is installed. Therefore landfill gas extraction systems should be installed immediately after the intermediate cover has been placed
- condensate collection and removal from landfill gas extraction system pipework
- regular inspection and maintenance of landfill gas extraction wells, manifolds, pipework, condensate management infrastructure, blowers, engines and flares
- landfill gas extraction infrastructure future planning to enable expansion of the gas extraction system as required to continually meet the BPEM gas action levels. For example, installing new engines and increasing the electrical interconnection (mains export capacity)
- having flaring capacity which matches the installed engine capacity to maintain gas extraction in the event of interconnection outage
- the use of passive landfill gas extraction and treatment if gas generation volumes are demonstrated to not be able to sustain an active landfill gas extraction system
- undertaking landfill gas extraction pumping trials to more accurately determine gas generation and design, and size an appropriate landfill gas management system.

In addition to mitigating hazards and impacts on humans and the environment landfill gas emissions should be controlled to reduce emissions of greenhouse gases. Methane and carbon dioxide are important greenhouse gases to control due to their radiative forcing impacts on global warming. There are also other potent greenhouse gases within the trace gases in landfill gas. These trace gases are minor by volume but have radiative forcing potential orders of magnitude greater than carbon dioxide and methane.

## L6 Progressive cover

*All waste in the cell(s) listed in Schedule 2, apart from at the active tipping face must be covered at all times.*

It is a required outcome of the Landfill BPEM to cover waste at least daily and to maintain a tipping area that is as small as possible.

Waste must be covered at all times to prevent odours, litter and to avoid vermin being attracted to the site. Progressive cover also reduces infiltration of surface water through waste and can help to reduce leachate generation. The only exception to this is during placement of the waste at the active tipping face, which should be progressively covered as the tipping face advances. All areas of the cell (including the tipping face) must be covered by the end of each day of filling (Condition L7).

It is understood that there may be isolated incidences where waste away from the tipping face may be uncovered for short periods of time such as drilling works or inclement weather. These incidences should be kept to a minimum and it is expected that waste be re-covered immediately on completion. In these isolated incidences, non-compliance does not need to be declared if they are kept to a minimum and exposed waste are re-covered immediately.

Waste materials recovered from the tipping face for recycling are not required to be covered.

## L7 Daily cover

*By the end of each day's operations waste must be covered in one of these ways:*

- with a layer of soil at least 0.15 metres thick if the waste is only solid inert waste;*
- with a layer of soil at least 0.30 metres thick for all other wastes;*
- using alternative cover approved by EPA in writing.*

The depth of the daily cover layer is dependent on the type of waste being deposited at the landfill. The default for daily cover will be 0.30 metres. The daily cover depth at premises that take only solid inert wastes will be 0.15 metres.

Daily cover should be removed prior to placing the next lift of waste to prevent perched leachate and compartmentalisation of the waste, this cover material can be reused, reducing demand for fresh cover material.

Daily cover at anything other than the specified depth of soil is deemed to be another method of cover. For EPA to consider an alternative method of cover, the landfill operator would need to demonstrate that it would meet or exceed the performance characteristics of soil.

Demonstration of compliance with this licence condition may be held by records in daily site inspection sheets or photographic or other evidence.

A critical factor in complying with this condition is the availability of sufficient cover material of suitable quality at the cell being filled. Materials other than soil must not be used without written approval from EPA.

### L7.1 Cover- asbestos

*You must cover waste asbestos immediately upon deposition in one of these ways:*

- with a layer of waste (not including waste asbestos) at least 1 metre thick or a layer of soil at least 0.3 metres thick;*

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b) *using alternative cover approved by EPA in writing.*

Waste asbestos needs to be covered immediately to ensure that any occupational health and safety risks associated with the deterioration of wrapping during transit are mitigated. Waste asbestos must be covered with a layer of waste (not including waste asbestos) at least 1 metre thick, or a layer of soil at least 0.3 m thick.

Where waste is used to cover the asbestos immediately, this must still be covered at the end of each day's operations in accordance with L7.

## L7.2 Cover - vermin and weed control

*You must implement controls for noxious weeds and vermin that accord with the requirements of Sections 7.12 and 7.13 of the Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788) including but not limited to:*

- a) *covering waste daily;*
- b) *minimising the introduction of noxious weeds to the site;*
- c) *eradicating any noxious weeds that have established themselves onsite.*

It is a required outcome of the Landfill BPEM to minimise the introduction of noxious weeds to the site.

This condition may be placed on your licence if there is a pre-existing vermin and/or weed control issue at the site.

Noxious weeds and vermin, whilst not controlled within the Environment Protection Act are recognised in the Landfill WMP and enacted through EPA Publication 788. Noxious weeds and vermin (typically flies, mosquitoes, rats and birds) are difficult to eradicate if they become established at a site and also have potential to spread to adjacent land if not controlled and monitored. Birds in particular are a common problem at landfill sites and can be a nuisance in residential areas or near airports so specialist management may be needed if they become established at sites. If noxious weeds are delivered for disposal, these should be buried at an appropriate depth to prevent their establishment.

Controlling vermin and weeds by covering waste, limiting food supply and any stagnant water combined with having good non-conforming waste procedures is good practice at any landfill however in certain circumstances EPA will require weed and vermin control as a condition of a licence. This may happen if weeds and vermin are well established and likely to cause nuisance to adjoining land and waterways.

As a minimum, to show compliance with this condition, you will:

- Have in place an inspection program for monitoring weeds and vermin;
- Have suitable controls to prevent the establishment of weeds and vermin at the site (including intervention such as weed spraying and bird scaring) where needed;
- A practice of recording inspections and actions taken to address vermin and noxious weeds in compliance with an auditor verified environmental monitoring program;
- Keep wastes compacted and covered at the end of daily operation or protracted delays in operation of the tipping faces;
- Limit and actively take measures to reduce standing water becoming stagnant.

## L8 Tipping Face

*You must:*

- a) *limit the area of the tipping face of each cell to [place holder – tipping face size];*
- b) *only operate one tipping face at any time unless a second tipping face is required for short term operational reasons; and*
- c) *ensure the active tipping face is mechanically stable as per Section 7.6 of the Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788).*

It is a required outcome to maintain a tipping area that is as small as possible. A suggested tipping face area is 900 m<sup>2</sup>, however it is understood that larger tipping areas may be acceptable at sites which have controls in place to control a larger tipping area.

To manage the potential amenity impacts (odour, litter, dust and vermin) that can arise from landfilling, it is important that only one tipping face is active at any one time. Short-term operational reasons for operating a second tipping face may include:

- when transitioning from a full cell into a new cell when a tipping face may be required in both cells for a short time
- if quarantined wastes are deposited in a separate area in the active cell
- if a temporary tipping face is set up for light windblown wastes on very windy days
- if required after an unplanned significant increase in waste volumes occurs such as after floods or bushfires.

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The smallest tipping face possible should be operated, this is a balance between minimising amenity impacts while allowing for safe vehicle movements and a safe working area for personnel working outside of vehicles.

It is also a required outcome of the Landfill BPEM to ensure that waste is placed so that faces are mechanically stable to enable vehicles safe access to compact the waste and place cover material. Gradients steeper than 1 vertical to 3 horizontal (1:3) should be avoided in order that appropriate waste compaction can be undertaken, daily cover can be applied and surface water run-off does not seriously erode the cover.

Perceived airspace savings from waste batters steeper than 1:3 are not realised as airspace must be subsequently sacrificed at cell closure to achieve an acceptable final cap profile.

Depending on the landfill setting, operation or waste type, EPA may require (in a licence condition) the tipping face to be shallower than 3h:1v to ensure that the face is capable of retaining daily or intermediate cover. Further information can be found in Section 7.6 of the Landfill BPEM.

## **L9 Waste deposition**

*You must ensure all of the following:*

- a) *Waste that is accepted for disposal at the premises is only placed into cell(s) listed in Schedule 2; and*
- b) *Waste for disposal is not placed outside of the perimeter of any cell(s) listed in Schedule 2.*

This condition is used in combination with the General condition WA1 to specifically control waste acceptance at a landfill site. Refer to Publication 1322 for further details on how to comply with WA1.

It is a required outcome of the Landfill BPEM that the landfill operator is to ensure that non-conforming waste is not disposed of at the landfill site. It is also required that the landfill operator implement a procedure to deal with the dumping of non-conforming waste at the landfill site.

Waste accepted for disposal at landfill sites must only be deposited within the active cells listed in Schedule 2 of your licence. This condition is also designed to ensure that waste is placed within the landfill cells only and not to other areas of the site that have not been engineered appropriately or approved by EPA.

This condition does not refer to waste accepted at the site for waste transfer activities.

This condition does not preclude the recovery and storage of recyclable materials such as concrete which may be stored outside of cells whilst awaiting crushing or recycling. It also does not preclude the storage of cover material such as soil outside of cells.

## **L10 Waste recovery**

*You must ensure that waste that has been previously deposited is not recovered and reprocessed except in accordance with written approval from EPA.*

Practices to recover materials that have already been placed as waste within landfill cells for either relocation or reprocessing for resource recovery are strictly controlled by EPA and must not be undertaken without the prior written approval of EPA. This is to ensure that the appropriate controls are in place with due regard for the potential environmental risks associated with such practice and that EPA is able to verify that appropriate waste handling and tracking procedures are in place.

This condition does not preclude the immediate recovery of recyclable or recoverable material such as tyres, metals, concrete, timber etc. from the tipping face.

This condition does not relate to transfer station activities as it specifically states that it relates to waste that has been previously deposited.

This condition does not preclude the removal of the previous day's daily cover.

## **L11 Waste stockpiling**

*You must ensure that waste is not stockpiled at the premises prior to deposit in a cell except in accordance with written approval from EPA.*

EPA expects the waste receipt process to include the prompt placement of accepted waste materials into the active landfill cell to prevent any amenity impacts and a limit on the time for waste to be stockpiled (in accordance with the licence). Short-term stockpiling may be required under extenuating circumstances (such as adverse weather) but it is EPA's expectation that EPA is notified of the need to stockpile large quantities of waste for disposal for an extended period of time.

This condition does not preclude the stockpiling of daily cover material or the stockpiling of recyclable or recoverable material whilst awaiting reprocessing or recycling.

This condition does not relate to transfer station activities as it specifically states that it relates to waste that is for deposition in a cell.

## **L12 Survey**

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You must ensure that an independent annual survey is conducted by a licensed surveyor, or other method approved by EPA in writing, by the end of June each year for each landfill cell at the premises and submitted to EPA with your annual performance statement. The survey must:

- a) confirm the volume and mass of air space consumed since the last survey; and
- b) verify that the top of the waste deposited in cells is in compliance with the EPA approved pre-settlement contour plan.

The independent annual survey of each landfill cell must be conducted by the end of the financial year (30 June) each year. It must provide contour plans with at least 1 metre intervals, determine the volume of air space consumed at each cell, and be provided to EPA with the annual performance statement.

Cell filling operations are required to remain within permitted limits. Indicators adopted by you and EPA to track the filling of a cell are the quantity of waste deposited in the cell and the remaining airspace relative to the approved pre-settlement contour plan. The quantity of waste deposited in the cell may be monitored by means of a weighbridge (relevant if you have condition L14) as a record of mass and by the annual survey, as a record of volume.

The results of the annual survey should be conducted by an independent licensed surveyor using a recognised and defensible survey method, including potentially drone technology.

Alternative methods of surveying may be used only if approved by EPA in writing.

As part of your APS you will be required to enter both the total volume (in cubic meters) and the weight (in tonnes) of all wastes received in the previous financial year. You will also need to specify the amount of Category B and C wastes. You must maintain all records used to support your APS or variations from this range.

Councils operating a small rural landfill receiving less than 20,000 tonnes of waste per annum may choose to use internal staff who are suitability qualified and independent (not associated with the day-to-day operation of the landfill) to undertake the annual survey.

A requirement of any new cell approval is the submission of a pre-settlement contour plan. This may be used to support an application for a new landfill cell by identifying the remaining capacity of the active cell(s) and, where less than a critical level, the need for construction of a new cell. The survey results may, where appropriate, also be used to demonstrate that the landfill is being progressively rehabilitated and can be closed.

## L13 Contours

You must manage each landfill cell so that the surface contour prior to settlement conforms to the surface profile grades in Section 8.1.5 of the *Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788)* or otherwise as approved by EPA in writing and so that one of the following is achieved:

- a) The top of waste prior to settlement is not higher at any point than the pre-settlement top of waste approved contour plan shown in Schedule 1.

OR

- b) The top of cap prior to settlement is not higher at any point than the pre-settlement top of cap approved contour plan shown in Schedule 1.

Using ongoing surveying of each cell being filled and the results of the annual survey, the licence-holder is required to manage filling to avoid over-filling of the cell. Allowance must be made for the height taken up by the landfill cap. The landform profile must also conform to the grades specified in the BPEM. Caps should not be steeper than 20% (1:5) to prevent erosion occurring and to assist with maintenance and access. Caps that are less than 5% (1:20) will need additional measures to be included to assist with drainage as part of the EPA approval process.

While cell height is used in the licence as a broad indicator of completeness of cell fill, the licence-holder should ensure that the contours and drainage lines of the filled cell meet those of the detailed design. The final cell height would typically be a point or line at the highest point of the capped cell, rather than a flat-topped area.

You are required, as part of any new cell approval, to update and provide to EPA your pre-settlement contour plan.

## L14 Weighbridge

A weighbridge must be used at the landfill to measure and record:

- a) the weight of waste received at the premises; and
- b) the weight of waste that is removed from the premises.

In accordance with Clause 16 (3) of the Waste Management Policy, a weighbridge is to be installed at municipal landfills located within the municipal districts listed in Schedule C of the Act. The purpose of the weighbridge is to facilitate accurate record-keeping for the purposes of invoicing clients, landfill levy documentation and monitoring waste disposal rates. Operation of the weighbridge must generate records of the amount of waste received, to enable the amount of levy or rebate to be calculated.

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Clause 16 (3) of the Waste Management Policy does not preclude the application of this condition to sites outside of the municipalities listed in Schedule C of the Act. EPA may choose to apply this condition to sites outside of those municipalities which have a weighbridge available on their premises as per Section 8 of EPA Publication 322.

In accordance with EPA Publication 322, it may not be practicable for small vehicles depositing waste and recyclable material at a landfill site to be weighed in at the weighbridge. This activity does not contradict this condition as long as the residual waste from the vehicles is weighed prior to deposition in the landfill cell.

## L15 Hotspots (prevention)

*You must take measures to prevent hotspots in the waste mass at the landfill site.*

A hotspot is an area of waste below the landfill surface with elevated temperatures accompanied by the evolution of heated gaseous products of thermal degradation, thermal oxidation or combustion, and the emission of visible and invisible radiation (modified from UK Environment Agency (2007), *Review and Investigation of deep-seated fires within landfill sites (Science Report SC010066)* and C & P Environmental (2008) *Industry Code of Practice, Management and Prevention of Sub-Surface Fires*).

It must be noted that literature on the subject often uses the terms 'hotspot', 'sub-surface fire' and 'thermal oxidation event' interchangeably.

It is a required outcome of the Landfill BPEM that all practical steps have been taken to prevent landfill fires.

It is your responsibility to ensure that appropriate management procedures are in place and implemented to prevent, identify and cool hotspots within the waste mass. These should include, but not be limited to:

- Installation and maintenance of fire fighting equipment and water supply appropriate for the size and activities at the site
- Fire response training for employees
- Site emergency procedures
- Identification of incoming hot loads of waste (at the weighbridge and tipping face)
- Identification of potential hot loads (criteria based on the waste types accepted at the site)
- Refusal of hot loads
- Isolation (in a suitable quarantine area) and cooling of hot loads prior to burial
- Good compaction of the waste to remove as much air as possible during burial
- Containment and disposal of fire fighting run-off water
- Management of heat generating wastes (e.g. shredder floc, green waste etc) i.e. no stockpiling of these types of wastes outside of the landfill cell, disposal of these wastes in thin layers in the landfill cell or mixing with non-combustible wastes during disposal
- Regular inspection and maintenance of the site surface, and penetrations through it, to ensure that cap integrity is maintained to prevent air ingress as far as practicable
- Regular inspection of the site for signs of hotspots within the waste mass, such as: visible smoke; burning odours; surface cracking, rapid localised subsidence; landfill gas balance indicators (CH<sub>4</sub>:CO<sub>2</sub> ratio, O<sub>2</sub> % v/v, CO ppm, H ppm, N<sub>2</sub> % v/v); landfill gas or leachate temperatures.

## L16 Hotspots (reporting)

*You must report hotspots within the waste mass to EPA within 24 hours of detection, and provide a follow-up action plan within 7 days detailing how the hotspot will be cooled, including monitoring, actions completed and to be taken, along with the proposed timeframes.*

This condition aims to ensure that EPA is aware of any potential negative environmental impacts and can respond appropriately.

To notify EPA you must call the 24-hour Pollution Hotline, 1300 EPA VIC (1300 372 842) with your licence number, site details and the name and number of a contact person on site.

Your notification will be assigned to the appropriate personnel within EPA for follow up.

## L17 Hotspots (management)

*You must manage hotspots within the waste mass in accordance with the Landfill Licensing Guidelines (EPA Publication 1323).*

It is your responsibility to take appropriate action to manage and cool hotspots within the waste mass. appropriate management measures should include:

- Identify the extent of the affected area and locate the hotspot core
- Seal the site surface, and penetrations through it, to prevent air ingress as far as practicable

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- Shut down the gas extraction system in the affected area, and consider reducing vacuum in wells adjacent to the affected area
- Undertake landfill gas surface emissions surveys to confirm site is sealed to air (as far as practicable)
- Introduce a diluent to cool the waste in the affected area (e.g. water, leachate, N<sub>2</sub>, CO<sub>2</sub>)
- Monitor the effectiveness of the actions taken via:
  - Landfill gas temperature (down-well probe within and adjacent to the affected area)
  - Landfill gas balance (portable landfill gas analyser and confirmation of readings by laboratory analysis of bag samples from representative gas wells)
  - Leachate temperature (within and adjacent to the affected area)
- Re-introduce extraction of landfill gas only when monitoring indicates typical landfill conditions e.g. O<sub>2</sub> < 5%, CO < 100ppm, CH<sub>4</sub>:CO<sub>2</sub> ratio at least 1.3:1, N<sub>2</sub> < 20%
- Re-introduce extraction progressively while frequently monitoring landfill gas balance and temperature from wells in the affected area.

## L18 Cell construction

You must:

- a) *notify EPA of your intention to commence construction of a new landfill cell at the premises by written notice in accordance with Appendix 7 of the Landfill Licensing Guidelines (EPA Publication 1323); and*
- b) *not start constructing a new cell without written EPA approval.*

Consistent with the Act, the occupier of a scheduled premise must not commence construction of, or change, any method or equipment used at the premises for the storage or disposal of waste which may harm the environment, without approval from EPA. EPA will use a combination of conditions to facilitate the cell notification, design, construction audit and filling process which is fully described in Sections B and C of this guideline.

Construction of a landfill cell, including any clearing of land, earthworks, excavation or other substantial action for the purpose of constructing a new landfill cell, cannot commence without written approval from EPA.

The approval process is tailored to ensure that the environmental impact of landfill cells is minimised by requiring design elements to protect beneficial uses.

The first step is notifying EPA of the intent to construct a new landfill cell. Details to be included in the notification and notification assessment criteria to be used by EPA are listed in Appendix 7 and Appendix 8 of this guideline. These include providing information on your efforts to progressively rehabilitate the landfill site and the case for additional cell capacity based on the remaining capacity of your site.

EPA will consider the status of progressive rehabilitation when considering the construction of any new cells.

## L19 Cell design

*Prior to commencing construction of a new landfill cell you must submit the following material to EPA so that it may consider whether or not to grant approval for the construction of the new cell:*

- a) *detailed designs of the landfill cell meaning plans, technical specifications and a construction quality assurance plan which comply with Section 6 and Appendices D, E and F of the Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788);*
- b) *an assessment report of the of the detailed designs prepared by a person who has been appointed as an environmental auditor under the Environment Protection Act 1970 in accordance with Appendix 14 of the Landfill Licensing Guidelines (EPA Publication 1323); and*
- c) *a completed and signed auditor declaration in the format shown in Appendix 15 of the Landfill Licensing Guidelines (EPA Publication 1323).*

Following notification of intention to construct a cell, the second step involves preparation of a detailed design of the cell including technical specifications and a construction quality assurance (CQA) plan. The CQA plan must meet the requirements of the Landfill BPEM.

The basic capping design must be submitted as part of this step. Once these documents have been prepared, you must engage an environmental auditor to assess the plans, technical specifications and the CQA plan for compliance with EPA requirements. Note that this auditor assessment is not a section 53V audit, but a less formal examination of the documentation, with the findings being reported in a declaration made by the auditor. The technical specifications or CQA plan may require revision, depending on the findings of the auditor.

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Once the auditor has completed the assessment declaration, you must forward the plans, technical specifications, CQA plan and auditor declaration to EPA for approval. If EPA accepts the application, approval will be granted for construction of the new cell.

## **L20 Cell – audit**

*Upon approval by EPA to construct each new landfill cell, you must engage a person who has been appointed as an environmental auditor under the Environment Protection Act 1970 to conduct an environmental audit and submit an environmental audit report to EPA. The environmental audit report must:*

- a) *verify that the construction of the new landfill cell is in accordance with EPA approved designs;*
- b) *assess any potential risks associated with the construction or use of the new landfill cell; and*
- c) *be prepared in accordance with section 53V of the Environment Protection Act 1970.*

Prior to EPA allowing waste to be placed in the new cell, an environmental audit of the cell construction must be completed. The purpose of the environmental audit is to verify that the construction of the cell is in accordance with EPA approved designs and assess any potential risks associated with the construction. The environmental audits required are audits specified under section 53V of the Environment Protection Act 1970 and are so called “risk of harm” audits. They must be conducted by an EPA-appointed environmental auditor.

## **L21 Cell approval**

*You must not commence filling of any new cell with waste without written approval of EPA.*

Once construction of the new landfill cell has been completed a construction audit report should be submitted to EPA for review and approval of the cell via a licence amendment. The new cell must not be used for waste disposal until a written approval is received from EPA for its use for waste disposal. EPA may issue additional conditions/requirements depending on the audit report findings and recommendations.

## **L22 Rehabilitation and aftercare**

*You must implement a rehabilitation plan for the landfill. The plan must:*

- a) *be revised after each cell is full, if necessary;*
- b) *meet the requirements of Section 8 of Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788);*
- c) *set timeframes for placement of final capping of all completed cells, calculated from the date that the cell became full; and*
- d) *set timeframes for the progressive capture and treatment of landfill gas and leachate from each completed cell.*

Progressive rehabilitation of landfill cells has a number of benefits that include; collection and treatment of landfill gas to meet the Landfill BPEM gas action levels and reduce offensive odours, minimising the generation of leachate and facilitating materials budgeting through the staged use of capping materials over the life of the landfill. It involves the sequential closure capping and aftercare management of filled cells throughout the operating life of the landfill.

Triggers for rehabilitation of a cell are detailed in Section 8.1 .3 of the Landfill BPEM and criteria for demonstrating that progressive rehabilitation is being actively conducted are identified in Section 8 of the Landfill BPEM. These are attached in Appendix 20 of this document.

A licence-holder must be able to demonstrate that progressive rehabilitation of filled cells is occurring. Maintaining multiple closed cells with just daily cover or many closed cells with intermediate cover is not acceptable and not a demonstration of progressive rehabilitation. Successful progressive rehabilitation can be achieved by completing rehabilitation works on closed cells using intermediate cover before a final cap, placing final caps incorporating leachate collection infrastructure in due course, installing gas extraction systems etc. or contracts having been issued for future works. The licence-holder may identify other means of demonstrating that progressive rehabilitation is in place at the landfill.

Rehabilitation of landfills, in particular landfill capping, is considered to be part of landfill cell construction and requires written EPA approval. EPA will consider the status of progressive rehabilitation when considering the construction of any new cells.

Where a landfill comprises one single tipping area and historically has not been subdivided into cells, progressive rehabilitation cannot be described on a cell by cell basis. These sites need to be progressively rehabilitated as soon as practicably possible. This could be achieved by limiting tipping to certain areas and completing tipping to the approved contour height before commencing tipping in other areas. A rehabilitation plan must be in place for the whole of these sites to allow compliance with this condition to be achieved.

This condition does not require cells that have already been rehabilitated to be retrospectively rehabilitated to BPEM standards.

## **L23 Intermediate cover specification-full cell**

*You must place intermediate cover on all cells within one month of the date that the cell became full. The intermediate cover must comprise a minimum of 500 mm of compacted clay or compacted clay rich soil or alternative cover approved by EPA in writing.*

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EPA acknowledges that intermediate cover is required in the short term until a final cap has been designed, approved and engineered. Intermediate cover must be sufficiently robust for the task of keeping the waste covered and contained until such time that the final cap is installed, allowing sufficient vacuum to be applied by the landfill gas extraction system to meet BPEM gas action levels and provide some retardation of infiltration of stormwater to reduce leachate generation. To achieve these aims intermediate cover must comprise a minimum thickness of 500 mm of compacted clay or compacted clay rich soil or an alternative cover approved by EPA in writing.

To show compliance with this condition, you must:

- have commenced the application of intermediate cover on the cell within one month of the date that waste was last placed in the cell with completion of the intermediate cover soon after
- have sufficient material in place to complete intermediate cover (500 mm of compacted clay or compacted clay rich soil) over the entire cell area.

## L24 Intermediate Cover specification – temporary cessation of filling in a cell

*In circumstances where the deposit of waste in a cell is likely to cease for a period of three months or more, you must place intermediate cover on the cell within one month of the date that waste was last placed in the cell. The intermediate cover must comprise a minimum of 500 mm of compacted clay or compacted clay rich soil or alternative cover approved by EPA in writing.*

Where waste is likely to not be placed in a cell for a period of three months or more, the requirements for intermediate cover as per L23 also need to be met.

## L25 Cap – design and approval

*Prior to commencing construction of each new section of landfill cap you must submit the following to EPA for approval:*

- a) detailed designs of the landfill cap, meaning plans, technical specifications and a construction quality assurance plan which comply with Section 8 and Appendices D, E and F of the Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788);*
- b) an assessment report of the detailed designs of the cap prepared by a person who has been appointed as an environmental auditor under the Environment Protection Act 1970 in accordance with Appendix 14 of the Landfill Licensing Guidelines (EPA Publication 1323); and*
- c) a completed and signed auditor declaration in the format shown in Appendix 15 of the Landfill Licensing Guidelines (EPA Publication 1323).*

Each new section of cap can be for an individual cell or more than one cell depending on the site's rehabilitation plan.

This condition does not require cells that have already been capped prior to the introduction of BPEM standards to be recapped.

The design of the capping system is part of the overall landfill cell design and is subject to the same approval process that applies to other components of the landfill cell. This process is detailed in Section C of these guidelines.

The final design, technical specifications and construction quality assurance plan for the final landfill cap must be endorsed by an environmental auditor prior to submission for EPA approval.

## L26 Cap – auditing

*Upon approval by EPA to construct each new landfill cap you must engage a person who has been appointed as an environmental auditor under the Environment Protection Act 1970 to conduct and submit an environmental audit report to EPA. The environmental audit report must:*

- a) verify that the construction of the cap is in accordance with EPA approved designs;*
- b) assess any potential risks associated with the construction; and*
- c) be prepared in accordance with section 53V of the Environment Protection Act 1970.*

Construction of the landfill cap should be audited by an environmental auditor (similar to the construction of a landfill base and side walls). This process is detailed in Section C of these guidelines.

This condition does not relate to cells that have already been capped prior to the introduction of BPEM standards.

## L27 Final capping

*You must complete final capping of cell (s) [X, Y, Z] within [placeholder] of the date that cell became full, in compliance with the approved rehabilitation plan.*

The BPEM states that the final capping be completed within 2 years of the date the cell became full. However it is understood that it may not be feasible to always achieve this timeframe, particularly in situations where the final proposed cap is a phytocap and in these cases an extended time frame may be negotiated with EPA.

The final capping should be in compliance with the approved rehabilitation plan.

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## L28 Closure

*You must provide EPA with at least 6 month's notice of your intention to cease accepting waste at the premises.*

The purpose of this condition is to provide EPA with advance notice of your intention to stop accepting waste so that EPA can begin the process of developing a strategy for closure, including the development of supporting pollution abatement notices for monitoring, rehabilitation and aftercare.

### References

Asbestos transport and disposal (EPA Publication IWRG611).

Assessment of the potential for methane gas movement from Victoria Landfills (EPA Publication 1270).

Best practice environmental management: Siting, design, operation and rehabilitation of landfills (EPA Publication 788) (Landfill BPEM).

Best practice guidelines for landfills receiving Category C prescribed industrial waste (EPA Publication 1208).

Calculating the landfill levy and recycling rebates (EPA Publication 332).

Clinical and related waste — operational guidance (EPA Publication IWRG612).

Grease trap waste (EPA Publication IWRG421).

Licence assessment guidelines (EPA Publication 1321).

Licence management (EPA Publication 1322).

PCB management (EPA Publication IWRG643).

Preparation of environmental audit reports on risk to the environment (EPA Publication 952).

Waste categorisation (EPA Publication IWRG600).

Waste codes (EPA Publication IWRG822).

Waste management policy (Siting, Design and Management of Landfills).

Waste transport certificates (EPA Publication IWRG821).

[www.epa.vic.gov.au/envaudit](http://www.epa.vic.gov.au/envaudit)

Soil hazard categorisation and management (EPA Publication IWRG621).

Soil sampling (EPA Publication IWRG 702).

Solid industrial waste hazard categorisation and management (EPA Publication IWRG631).

Used containers (EPA Publication IWRG644).

## Appendix 2: Landfill gas risk assessment

### A2.1 Introduction

A landfill gas risk assessment may be conducted using the method described in the United Kingdom (UK) Environment Agency publication, *Guidance on the management of landfill gas*, LFTGN 03, 2004. (Search the United Kingdom Environment Agency website for 'EA EP171'.) The landfill gas risk assessment process described below is based on that for a 'simple quantitative risk assessment' described in the UK guidelines. The original publication should be referred to in order to gain greater understanding of landfill gas risk assessment.

The basic risk assessment approach, summarised below, involves:

- development of a conceptual model of the landfill and its surroundings
- hazard identification and risk screening
- quantitative risk assessment.

### A2.2 Conceptual model

A conceptual model for the landfill and surrounding environment should be prepared with regard to landfill gas generation and management. The model should include information on:

- the nature of the waste and source of landfill gas
- the environmental setting of the landfill, including all receptors
- initial selection of environmental benchmarks (beneficial use indicators)
- the design of the landfill gas collection and treatment systems
- operational management and control measures to be implemented
- the pathways to receptors, including emission points for landfill gases and combustion products.

The form and content of the conceptual model should be selected to reflect the scale and complexity of the operation and be suitable for use in the risk assessment. Consideration should also be given to the potential requirements of the environmental auditor, who would be examining the landfill gas risk assessment as part of the environmental audit program.

### A2.3 Hazard identification and risk screening

The objectives of the hazard identification and risk screening stage are to; consider the information contained in the conceptual model, consider the sensitivity of the receptors and select appropriate emission target limits and consider the potential impacts on each receptor. The elements of this step, described in detail in the UK guidelines are:

- the source of risk — based on the type of waste deposited in each landfill cell
- the receptors — the number and type and location of the various receptors
- initial selection of environmental benchmarks
- the pathways to the receptors — for example, direct release to atmosphere, sub-surface migration, indirect release to atmosphere or direct release of combustion products
- prioritisation of receptors and impact assessment
- determination of the dispersion of the emitted gas
- recommendations for further risk assessment.

### A2.4 Basic quantitative risk assessment

At landfills where a risk assessment has not been previously conducted, a basic or 'simple' risk assessment should be conducted initially. A 'complex' risk assessment should be conducted for landfills where the simple risk assessment identifies substantial risks, for landfills located in an environmentally sensitive setting, or for large scale landfills.

The risk assessment should examine:

- the likely composition and volumes of the landfill gas
- the estimated period of time over which landfill gas emissions will occur and be managed
- review of the environmental benchmarks
- impacts of the gas emissions.

The results of the risk assessment are used to determine the requirement for landfill gas monitoring and may be used for management of the risks through implementation of suitable collection and disposal measures.

## Appendix 3: Suggested criteria to identify low-risk rural landfills

Criteria to identify landfills with a low potential for environmental harm are provided below.

Each of these criteria must be met for a landfill to be regarded as presenting a low risk to the environment.

These criteria may be adopted without modification; however, an environmental risk assessment conducted for a landfill may determine that a landfill that meets these criteria should be regarded as a higher-risk landfill.

Small rural municipal landfills that meet criteria set out in A3.1 may use Type 3 landfill design criteria for capping and lining systems. This variation to the requirements for Type 2 landfill containment systems is made on the basis that small, appropriately located rural landfills may meet the relevant environmental protection objectives with Type 3 design.

### **A3.1 Low-risk rural landfills**

These meet all of the following conditions:

- They receive less than 20,000 tonnes of waste per annum.
- It meets or exceeds the buffer requirements as set out in the BPEM (i.e. the landfill is located remotely from sensitive receptors such as 500m from residences and 100m from waterways etc.).
- Wastes are deposited at least two metres above the long term undisturbed groundwater level.
- They are not located in areas of Segment A groundwater
- A financial assurance is in place.

Any requests to categorise a landfill as a low risk rural landfill for design purposes under this scenario should be submitted with adequate information to justify the request, and with an assessment from an environmental auditor. This assessment is similar to the assessment required for new landfill cell designs (see Appendix 14 for details).

The EPA will determine whether the subject landfill could be considered as a low risk rural landfill for design purposes under this scenario, following a review of the information submitted with the request. The decision to categorise a landfill as a low risk rural landfill for design purposes rests with EPA.

## Appendix 4: Parameters that may be included in an environmental monitoring program

An environmental monitoring program for a landfill must be appropriate to the nature and extent of its potential environmental impacts. The monitoring program must be sufficient for the licence-holder to be able to demonstrate compliance with all licence conditions.

Consideration should be given to the types of waste that are deposited in the landfill, their chemical characteristics and the geological and hydrogeological context of the landfill. Development of a conceptual model for the site can aid this process.

Landfill operations can have impacts on various sectors of the environment. These impacts might include:

- groundwater contamination
- surface water contamination
- leachate emissions
- off-site odour emissions
- off-site dust emissions
- off-site litter and waste emissions
- off-site noise emissions
- on-site and off-site landfill gas emissions.

Media that may need to be monitored would include groundwater, surface water, leachate, fugitive landfill gas emissions, air quality (dust and odour) and noise levels.

The monitoring program should assess both the discharges from the landfill site and the impact of those discharges on the receiving environment.

Parameters that need to be considered when developing a monitoring program may include:

- analytes (organic and inorganic indicators)
- physico-chemical indicators (pH, temperature, dissolved oxygen, electrical conductivity, visible dust, litter, odour, etc)
- method detection limits for the analytes
- groundwater and leachate standing water levels
- acceptance limits and action trigger levels for each parameter.

Other information that should be included in the monitoring program includes:

- results of the landfill gas risk assessment (see Appendix 2)
- infrastructure required for monitoring
- location of monitoring or sampling points
- equipment required for monitoring
- frequency of monitoring
- monitoring procedures to be followed, including sample storage and transport requirements
- other triggers for monitoring (e.g. rainfall events)
- person and back-up person responsible for monitoring
- analysis of monitoring results.

## Appendix 5: Scope of environmental auditor verification of an environmental monitoring program

The purpose of this appendix is to provide additional support to an environmental auditor undertaking an assessment of a landfill environmental monitoring program for the purposes of verification in accordance with landfill licence condition L1.

### A5.1 Assessment objective

The objective of the monitoring program assessment is to verify that the monitoring program is sufficient for the licence-holder to:

- determine compliance with the licence conditions
- monitor and evaluate management of risks to the environment from the licensed site activities
- specify an environmental audit frequency that reflects the overall environmental risk presented by the landfill.

### A5.2 Assessment scope

The assessment will consider and make comment on all aspects of the licence-holder's site risk assessment and environmental monitoring program as it relates to the licensed site activities and their impact on the environment.

This may include assessment of licence obligations, sampling infrastructure, sampling methods and protocols, laboratory analysis QA/QC program or any other matter deemed appropriate by the environmental auditor to meet the objective of verifying the licence-holder's monitoring program.

### A5.3 Conducting the assessment

The assessment would be conducted in a manner deemed appropriate by the environmental auditor and may include assessment of:

- monitoring programs, objective, scope (temporal and spatial), role and responsibilities, delivery mechanisms
- the site risk assessment and identified potential impacts
- attention to all licence conditions
- wastes accepted and likely contaminants
- sampling and testing methods, protocols, parameters and frequencies
- incorporation of applicable SEPP parameters, EPA guidelines etc
- appropriateness of analytical parameters to determine the presence and magnitude of the monitored environmental impacts
- sampling infrastructure and sampling locations
- appropriateness of QA/QC program
- suitability of the monitoring program to clearly specify required monitoring and the delivery of the required monitoring
- adequacy of the document control system as a secure and accessible repository of monitoring information.

### A5.4 Verification of the monitoring program

An environmental auditor, having assessed a licence-holder's risk assessment and monitoring program, may verify that, in their opinion and having regard to the licence conditions and other relevant policies or documents published by the Authority (or other relevant bodies such as guidelines, codes of practice etc), the program is sufficient to enable the licence-holder and EPA to determine compliance with the licence.

Where an auditor is unable to verify the monitoring program, the auditor must notify the licence-holder in writing providing the reasons and forward a copy of that notification to EPA. The licence-holder must advise EPA immediately as to the action that must be taken to implement any recommendations made by the auditor.

Written verification of a monitoring program is to be included in the environmental audit report.

## Appendix 6: Scope for audit of landfill operation

Landfill operation audits must follow the method specified in Environmental auditor guidelines for the preparation of environmental reports on risk to the environment (EPA Publication 952).

In order to streamline the landfill auditing process, audits of landfill operations using the scope specified below may be conducted without prior approval by EPA. In addition, EPA does not require submission of a courtesy copy of the audit scope.

### A6.1 Audit objective

The objective of the audit is to identify and, where possible, quantify the risk of any possible harm or detriment to a segment of the environment caused by operation of the landfill. The audit must include a review of the completeness of the site risk assessment and re-verification of the monitoring program.

### A6.2 Audit scope

#### Activity to be audited

The activity to be audited is operation of a landfill.

#### Component of the activity to be considered

The audit will assess all aspects of landfill operation.

In addition, the audit will consider and make comment on the risk assessment and environmental monitoring program and progressive rehabilitation of landfill cells, including capping of any cells in the previous period.

The auditor must provide comment on the ability of the monitoring program to generate sufficient information to enable compliance with licence conditions to be determined.

#### Segment of the environment to be considered

The segment of the environment to be considered during the audit will be the area of land on which the landfill is located, including the atmosphere at the site, groundwater beneath the site and any surface water on the site, and the environment surrounding the landfill to which the activity may pose a risk.

#### Elements of the environment to be considered

The environmental auditor will consider groundwater, surface water, land, odour, atmosphere and management of landfill gases, including potential offsite migration. Other elements may be included in the audit at the discretion of the environmental auditor.

#### Beneficial uses to be considered

Beneficial uses to be considered during the audit will be those specified in the State environment protection policies to be identified by the environmental auditor.

#### Risk assessment to be conducted

The environmental auditor will conduct a qualitative or semi-quantitative assessment of risks associated with the landfill as an integral part of the section 53V environmental audit. The method of risk assessment would be determined by the environmental auditor.

#### Period of time over which the audit is to be conducted

The audit would consider operations at the landfill for the period of time since the last audit, in addition to relevant past operations.

#### Exclusions from the scope of the audit

The environmental auditor will identify any exclusions from the environmental audit.

### A6.3 Audit criteria

Audit criteria may be drawn from the following policies, documents and guidelines:

- Environment Protection Act 1970.
- Relevant State environment protection policies.
- Existing EPA licence for the premises.
- The EPA-approved technical specifications and CQA plan.
- Landfill environmental monitoring program.
- Best practice environmental management — siting, design, operation and rehabilitation of landfills (EPA Publication 788).
- Waste Management Policy (Siting, Design and Management of Landfills).
- Any other publications deemed relevant by the environmental auditor.

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## A6.4 Conducting the audit

The audit would be conducted in a manner deemed appropriate by the environmental auditor and would typically include the steps of:

- familiarisation with landfill operations
- inspection of the landfill operating area
- detailed assessment of the operations including progressive rehabilitation (see Appendix 19)
- assessment of risk to beneficial uses of the segments concerned
- review of the risk assessment
- examination and verification of the environmental monitoring program
- preparation of an environmental audit report.

## A6.5 Environmental audit report

The environmental audit report for this audit would generally be consistent with section 15 of Publication 952 and therefore section 53V of the Environment Protection Act 1970.

The location within the report of the various audit findings, including those listed below, must be identified in a table provided in the report.

The items listed below for inclusion in the table are a minimum requirement. The environmental auditor may elect to include additional items in the table.

The report must clearly state the environmental auditor's opinion on the risks posed by the proposed landfill operations to the beneficial uses of the nominated segments.

In addition, the report must include comment on whether the risks to the environment associated with landfill operation are being adequately identified, managed and monitored.

The audit report must have an EPA CARMs reference number clearly displayed on the report cover. The licence-holder must enter this number in their APS in years where an audit has been conducted.

A copy of each audit report must be lodged with EPA.

### Location of audit findings within the landfill operation audit report

Audit findings	Location in audit report (chapter or section)
Risk of landfill operations to beneficial uses identified by the environmental auditor	
Comment on the risk assessments (site operation and landfill gas) prepared by landfill operator	
Comment on the completeness of the environmental monitoring program, including comment on the audit frequency	
Assessment of the adequacy of the monitoring program to determine compliance with licence conditions	
Assessment of implementation of the monitoring program	
Interpretation of monitoring results	
Verification of the environmental monitoring program	
Implementation of progressive rehabilitation	
Recommendations (including prioritisation)	
Implementation of recommendations made in previous audit reports	

## Appendix 7: Landfill cell notification requirements

The following information must be provided by a landfill licence-holder when notifying EPA of their intent to construct a new landfill cell.

1. The classification of the landfill (see Landfill BPEM).
2. The community and operational need for a new landfill cell (with reference to current available air space).
3. The dimensions of the proposed cell; specifically, length, breadth and depth or other details necessary to clearly define the dimensions of the cell if of an irregular shape.
4. The volume of the proposed cell and the planned quantity of waste (in tonnes) that is to be deposited in the cell.
5. The type of waste or wastes, including the waste category, to be deposited in the cell.
6. The planned life of the cell, assuming a waste density of 1.1 tonnes/m<sup>3</sup>.
7. A legible premises plan suitable for inclusion in Schedule 1B of your licence that shows:
  - licence number and name of company
  - premises boundary and the approved works approval boundary (and any subsequent works approval boundaries)
  - clearly identified closed, active and future cell boundaries and names
  - scale bar and north arrow
  - AMG coordinates
  - discharge points
  - key buildings and site access road
  - leachate ponds and stormwater infrastructure (where available)
  - legend
  - jpeg format
  - surrounding roads and watercourses (preferable)
  - satellite underlay (optional)
8. A pre-settlement contour plan suitable for inclusion in Schedule 1C of your licence that shows:
  - licence number and name of company
  - premises boundary and the approved works approval boundary (and any subsequent works approval boundaries)
  - scale bar and north arrow
  - AMG coordinates
  - legend
  - jpeg format
  - pre-settlement contours of the entire landfill with at least 1 m intervals, including the proposed cell
  - pre-settlement contours must be identified as being top of waste or top of cap
  - where contours are top of cap, the plan should show the cap grade in % format e.g. 5%, 10% etc.as per BPEM requirements
  - pre-settlement contour plans must come with evidence of approval by the planning authority
9. Documentary confirmation to show that the new cell is within the EPA-approved area.
10. Documentary evidence from the relevant planning authority that the proposed cell is consistent with planning approval held.
11. An overall locality plan showing the location of access roads and sensitive receptors.
11. The buffer distances between the boundaries of the new cell and the nearby sensitive receptors.
12. The status of rehabilitation of used cells and a program for rehabilitation of the current cell.

## Appendix 8: Criteria for assessment of landfill cell notification by EPA

The notification of the requirement for a new landfill cell will be assessed by EPA using the criteria listed below. These criteria will be considered in addition to the information provided in the notification by a landfill licence-holder.

1. The past environmental performance of the licence-holder.
2. The past regulatory compliance of the licence-holder.
3. The history of progressive rehabilitation of existing landfill cells (see Appendix 20) and the status of rehabilitation of used cells.
4. The level of utilisation of existing landfill cells.
5. The landfill classification (see Landfill BPEM).
6. The community and operational need for the proposed cell, including the consistency of the proposed cell with regional waste management planning.
7. The dimensions, capacity and anticipated life of the cell.
8. The types of waste to be deposited in the cell.
9. The consistency of proposed wastes with licence conditions.
10. The location of the proposed cell is within the licensed landfill footprint.
11. Planning approvals held and relevant planning conditions.
12. The pre-settlement height of the cell does not exceed the planning approval.
13. The proposed cell is supported by surrounding infrastructure.
14. The proposed cell would not be in conflict with sensitive receptors and land zoning.

## Appendix 9: Preparation of plans (designs) for a new landfill cell

The new cell must be designed to ensure that it is able to protect the environment. The designs of the new cell should show how they will achieve the design objectives and required outcomes of the BPEM. This means providing details of the suggested measures and/or indicative designs of the BPEM. If the designs include alternatives to the suggested measures of the BPEM, they must meet the objectives and required outcome of the BPEM and provide at least an equivalent environmental outcome to that provided by the suggested measures.

Examples of details/elements to be included in the plans/designs are listed below.

Some elements included below — for example, groundwater relief infrastructure — are site-specific and may not be required in all cases. If low-risk rural landfill criteria (Appendix 3) are assessed as appropriate then the 'type 3' Landfill BPEM standard will apply.

Note that the list of elements provided below is not exhaustive and the technical specifications must be prepared to meet the requirements of the landfill cell for which they have been prepared.

Table of new landfill cell designs (plans)

Component	Parameter
Location map	<ul style="list-style-type: none"> <li>• Location of the site</li> <li>• Access roads, major landmarks and receptors marked (i.e. creeks, rivers, building etc.)</li> </ul>
Premises map	<ul style="list-style-type: none"> <li>• Boundary of the approved area (works approval or licensed area)</li> <li>• Locations of all the cells with identification numbers (that means the used cells, proposed cells and the future cells);</li> <li>• Location of the leachate pond(s).</li> </ul>
Maps/designs of the new cell	<ul style="list-style-type: none"> <li>• The subgrade plan;</li> <li>• The plans for the liner components or the proposed liner system (i.e. top of clay, top of geomembrane, top of the drainage layer and top of the separation/filter geotextile etc.) as appropriate;</li> <li>• The leachate collection system (the distribution of leachate collection pipes, sump, leachate extraction/removal pipes with appropriate grades/slopes etc.);</li> <li>• Cross sections (at least North-South and East-West or as appropriate) showing bund walls and all perimeter side walls. Note that all heights (base, sump, liner and the perimeter side walls should be shown in m, AHD);</li> <li>• The typical liner system in detail for the base, all perimeter walls and separation bunds (if applicable);</li> <li>• Details of liners and the leachate collection system and how they are to be connected to adjoining landfill cells, leachate pond etc.; (Note: if the new cell adjoins an old unlined or non-BPEM compliant cell, separation liner details are required);</li> <li>• Details of the pipes (leachate collection pipes, leachate riser pipes, leachate collection sump etc.)</li> <li>• Note: Landfill liner system includes the barrier system(s), leachate collection system (leachate collection pipes, a drainage layer etc.) and the associated cushion and separation/filter geotextiles for the base, side walls and the landfill cap.</li> <li>• Anchor trench details;</li> <li>• Preliminary designs for the landfill cap with heights marked in mAHD as appropriate.</li> </ul>

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Component	Parameter
Leachate management	<ul style="list-style-type: none"> <li>• Location of the leachate pond;</li> <li>• Details showing the leachate pond, its management, its connection system to the leachate sump etc.</li> <li>• An assessment on the adequacy of the existing leachate management system to manage leachate from the proposed new cell;</li> <li>• Configuration of the drainage pipes</li> <li>• Required spacing of the drainage pipes</li> <li>• Note (If the existing leachate management system is not adequate, designs for a new leachate pond is required. If not, an alternative leachate management system is required for EPA review and approval).</li> </ul>
Rehabilitation	<ul style="list-style-type: none"> <li>• Progress of the rehabilitation of used cells;</li> <li>• A program for rehabilitation of the existing cell;</li> <li>• A program for the rehabilitation of proposed new cell;</li> <li>• Preliminary capping design for the new cell</li> <li>• Pre-settlement top of waste contours;</li> </ul>
Landfill gas management	<ul style="list-style-type: none"> <li>• Preliminary designs for the landfill gas system (both sacrificial gas collection system if applicable and final gas collection system).</li> </ul>
Stormwater management	<ul style="list-style-type: none"> <li>• A map showing how the stormwater flow will be managed (i.e. catchment management).</li> </ul>

## Appendix 10: Preparation of technical specifications for a new landfill cell

The design technical specifications must give details of each construction element of the proposed landfill cell and include assessable specifications for each element. Only the basic landfill cap design must be prepared and submitted to EPA.

Examples of elements to be included in the technical specifications are listed below.

Some elements included below — for example, groundwater relief infrastructure — are site-specific and may not be required in all cases. If low-risk landfill criteria (Appendix 3) are assessed as appropriate then the 'type 3' Landfill BPEM standard will apply.

Note that the list of elements provided below is not exhaustive and the technical specifications must be prepared to meet the requirements of the landfill cell for which they have been prepared.

Table of new landfill cell design technical specifications

Component	Parameter
Preparatory earthworks	<ul style="list-style-type: none"> <li>• Sub-grade preparation including soft spot rectification and minimum depth to be back-filled</li> <li>• Sub-base construction materials, quality and tolerances</li> <li>• Thickness of lifts</li> <li>• Compaction method</li> <li>• Quality assurance testing</li> <li>• Repair of failed areas</li> <li>• General erosion, sediment and dust controls</li> <li>• Slope stability information where the side wall slope is steeper than 3:1.</li> </ul>
Groundwater relief infrastructure (if required)	<ul style="list-style-type: none"> <li>• Anticipated groundwater extraction requirements and pump sizing</li> <li>• Trenches</li> <li>• Trench lining and drainage material</li> <li>• Pipe specifications, installation and backfill</li> <li>• Groundwater sumps</li> <li>• Method of pumped groundwater disposal</li> <li>• Survey of as-constructed system, including the level of the lowest point of the leachate collection system</li> </ul>

Component	Parameter
Clay liner	<p>Clay liner material specifications:</p> <ul style="list-style-type: none"> <li>• Maximum hydraulic conductivity of clay</li> <li>• Permeability of clay</li> <li>• Particle size distribution of clay</li> <li>• Plasticity of clay</li> <li>• Moisture content of clay</li> <li>• Cation exchange capacity of clay</li> </ul> <p>Clay liner construction specifications</p> <ul style="list-style-type: none"> <li>• Overall thickness of clay liner</li> <li>• Thickness and number of lifts to be used</li> <li>• Compaction method and required level of compaction</li> <li>• Method of enhancing bonding between lifts and keying into existing cell liners</li> <li>• Grades (slopes) of the liner</li> <li>• Smoothness of the final surface</li> <li>• Quality assurance testing</li> <li>• Repair of failed areas.</li> </ul>
Geosynthetic clay liner (if required)	<ul style="list-style-type: none"> <li>• Geosynthetic clay liner (GCL) specifications as per BPEM</li> <li>• Condition of underlying surface</li> <li>• Method of placement</li> <li>• Weather restrictions during installation</li> <li>• Quality assurance testing</li> <li>• GCL handling and installation as per BPEM.</li> </ul>
Geomembrane	<ul style="list-style-type: none"> <li>• Geomembrane specifications as per BPEM</li> <li>• Handling and storage</li> <li>• Condition of underlying surface</li> <li>• Method of placement</li> <li>• Method of welding or seaming</li> <li>• Weather restrictions during installation</li> <li>• Quality assurance testing</li> <li>• Repair of failed areas.</li> </ul>

Component	Parameter
Cushion geotextile (if required)	<ul style="list-style-type: none"> <li>• Geotextile specifications as per BPEM</li> <li>• Anticipated loading on the geotextile</li> <li>• Handling and storage, including measures to minimise damage from UV exposure</li> <li>• Condition of underlying surface</li> <li>• Method of placement</li> <li>• Method of jointing</li> <li>• Weather restrictions during installation</li> <li>• Quality assurance testing</li> <li>• Repair of failed areas</li> <li>• Note: cushion geotextile specification should be based on waste height, mass and site characteristics.</li> </ul>
Leachate collection and management system	<ul style="list-style-type: none"> <li>• An assessment of the adequacy of the leachate management system to handle leachate from the proposed new cell. If the existing management system is inadequate a new management system (i.e. leachate pond) will be required;</li> <li>• Configuration of the drainage pipes</li> <li>• Required spacing of the drainage pipes</li> <li>• Leachate collection pipe specifications (resistance to chemical attack, ability to withstand anticipated vertical loading stress and ability to be inspected and cleaned)</li> <li>• Pipe placement and welding</li> <li>• Drainage aggregate specifications for both base and walls</li> <li>• Geotextile filter fabric specifications</li> <li>• Method of leachate storage and management</li> </ul>
Filter/separation geotextile	<ul style="list-style-type: none"> <li>• Geotextile specifications</li> <li>• Handling and storage</li> <li>• Condition of underlying surface</li> <li>• Method of placement</li> <li>• Method of jointing</li> <li>• Weather restrictions during installation</li> <li>• Quality assurance testing</li> <li>• Repair of failed areas.</li> </ul>
Cap design (indicative only)	<ul style="list-style-type: none"> <li>• Type of cap</li> <li>• Types of materials for the cap</li> <li>• Typical cross-section of the proposed landfill cap</li> <li>• Stormwater management.</li> </ul>

## Appendix 11: Preparation of construction quality assurance plan for a new landfill cell

A construction quality assurance (CQA) plan provides a means of demonstrating to the public and regulating authorities that the landfill cell being constructed meets its design requirements.

The CQA plan must enable the licence-holder to verify that the materials used comply with specifications and the method of construction is appropriate and, as a result, design requirements have been met (Landfill BPEM).

The CQA plan must identify the parameter to be inspected or tested, the frequency or timing of the inspection, performance indicators and the responsibility for the inspection. The minimum test frequencies must meet or exceed those specified in the Landfill BPEM. The CQA plan must also include Level 1 supervision requirements (where appropriate) and hold points to be observed to enable inspection of the works by the environmental auditor. Parameters to be included in the CQA plan are listed below.

Note that the list of parameters provided below is not exhaustive and the parameters included in the CQA plan must meet the requirements of the landfill cell for which they have been prepared. If low-risk landfill criteria (Appendix 3) are assessed as appropriate then the 'type 3' Landfill BPEM standard will apply.

Table of new landfill cell construction quality assurance requirements

Component	Parameter
Sub-grade and clay liner	<p>Sub-grade:</p> <ul style="list-style-type: none"> <li>• Bearing capacity of the sub-grade including lack of soft ground</li> <li>• Groundwater relief trenches and extraction system</li> <li>• Groundwater relief grid alignment, grades and levels</li> <li>• Survey of installed groundwater relief system</li> </ul> <p>Clay liner:</p> <ul style="list-style-type: none"> <li>• Properties of clay for clay liner</li> <li>• Clay liner placement quality (absence of clods, moisture content, homogeneity, etc)</li> <li>• Thickness of lifts, compaction and bonding between lifts</li> <li>• Overall thickness of clay liner</li> <li>• Permeability of clay liner</li> <li>• Surface of clay liner (smooth, required grade, free of cracking, etc)</li> <li>• Survey of clay liner surface to confirm final thickness.</li> </ul>
Geosynthetic clay liner	<ul style="list-style-type: none"> <li>• Condition of liner prior to placement</li> <li>• Placement of liner</li> <li>• Condition of liner following installation (no defects or damage, hydration adequate, etc)</li> <li>• Anchoring of liner</li> <li>• Method of joining rolls.</li> </ul>
Geomembrane	<ul style="list-style-type: none"> <li>• Condition of geomembrane prior to placement</li> <li>• Suitability of sub-base</li> <li>• Placement of geomembrane</li> <li>• Welding of seams</li> <li>• Testing of seams</li> <li>• Condition of geomembrane following installation (no defects or damage, etc)</li> <li>• Anchoring of geomembrane.</li> </ul>

Component	Parameter
Cushion geotextiles	<ul style="list-style-type: none"> <li>• Specifications of the geotextile</li> <li>• Condition of geotextile prior to placement</li> <li>• Placement of geotextile</li> <li>• Joining of seams</li> <li>• Inspection of seams</li> <li>• Condition of geotextile following installation (no defects or damage, etc)</li> <li>• Anchoring of geotextile</li> <li>• Method of joining rolls.</li> </ul>
Drainage layer and leachate storage and collection system	<p>Leachate collection and storage system:</p> <ul style="list-style-type: none"> <li>• Leachate collection system</li> <li>• Leachate collection system piping, fittings and equipment</li> <li>• Leachate collection system piping alignment and spacing</li> <li>• Leachate collection system piping welding and jointing</li> <li>• Survey of installed leachate collection system including sump</li> <li>• Identification of the level of the lowest point of the leachate drainage system</li> </ul> <p>Drainage layer:</p> <ul style="list-style-type: none"> <li>• Drainage layer aggregate placement (grade, levels, thickness, etc)</li> <li>• Drainage layer placement on the side walls</li> <li>• Geotextile filter fabric installation</li> <li>• Survey of installed drainage layer thicknesses.</li> </ul>
Filter/separation geotextile	<ul style="list-style-type: none"> <li>• Specifications of the geotextile</li> <li>• Condition of geotextile prior to placement</li> <li>• Placement of geotextile</li> <li>• Joining of seams</li> <li>• Inspection of seams</li> <li>• Condition of geotextile following installation (no defects or damage, etc)</li> <li>• Anchoring of geotextile</li> <li>• Method of joining rolls</li> </ul>
Sampling and testing	<ul style="list-style-type: none"> <li>• A clearly explained process for the sampling of material (geomembrane, GCL, geotextile etc.) to ensure that the samples are obtained once the material is delivered to the site. Note that sampling should be undertaken by a third party CQA consultant/inspector ('CQA" consultant) in order to avoid any potential conflict of interest issues. If necessary, samples may be collected by the contractor in the presence of a 3<sup>rd</sup> party CQA consultant. However, contractors or the suppliers should not be involved in handling and transporting samples to the laboratory or receiving test results. Ideally, the lab test results should go the 3<sup>rd</sup> party CQA consultant and the auditor at the same time. Auditor's role to observe the process should also be explained</li> </ul>
Leak detection survey (applicable for geomembrane liners only)	<ul style="list-style-type: none"> <li>• A leak detection survey is recommended to ensure that the geomembrane liner (once installed) is free of holes and damages. This survey should be conducted by an independent party (it should not be organised or conducted by landfill cell construction contractor).</li> </ul>

## Appendix 12: Hold points to be implemented during landfill cell construction

Suggested hold points to be implemented during construction of the new landfill cell are listed below.

These hold points, to be established at the discretion of the environmental auditor, are to be observed by the landfill cell construction manager to enable the environmental auditor to inspect the cell at critical points of its construction.

Note that the auditor may wish to consider different hold points if the low risk rural landfill criteria (Appendix 3) are met.

Table of suggested hold points to be implemented during landfill cell construction

Landfill cell component	Construction activity
Sub-grade	<ul style="list-style-type: none"> <li>• Completion of sub-grade</li> </ul>
Clay liner	<ul style="list-style-type: none"> <li>• Testing of the clay materials</li> <li>• Completed clay liner surface</li> <li>• Final clay liner surface</li> </ul>
Geosynthetic Clay liner (GCL)	<ul style="list-style-type: none"> <li>• Testing of GCL</li> <li>• Complete installation of the GCL</li> </ul>
Geomembrane	<ul style="list-style-type: none"> <li>• Testing of geomembrane</li> <li>• Placement of first geomembrane</li> <li>• Representative samples geomembrane welding</li> <li>• Completion of geomembrane lining</li> </ul>
Drainage layer and leachate collection pipes	<ul style="list-style-type: none"> <li>• Testing of drainage material</li> <li>• Completion of placement of leachate collection pipes</li> <li>• Completion of placement of drainage layer materials</li> <li>• Completion of placement of geotextiles</li> <li>• Condition of HDPE post-aggregate layer</li> <li>• Completion of side wall drainage layer</li> <li>• Completion of side wall liner (including the drainage/protection layer) if it is constructed in more than one lift</li> </ul>
Side walls	<ul style="list-style-type: none"> <li>• Final installation of side wall liners (this includes the barrier system and the drainage layer)</li> <li>• At incremental installation stage of side walls if they are constructed in more than one lift</li> </ul>
Leak detection survey	<ul style="list-style-type: none"> <li>• Completion of the leak detection survey (if applicable)</li> </ul>

## Appendix 13: Design report requirements

It is a requirement in Victoria that new landfill cell and cap designs be submitted to EPA for approval prior to commencement of construction. Further, prior to submission to EPA, the design must be verified by an Environmental Auditor,

Cell and cap design must be based on requirements of the Best Practice Environmental Management Guideline (Siting, Design, Operation and Rehabilitation of Landfills) (BPEM). While the BPEM outlines design requirements for landfill cells and caps, there are many decisions that the designer needs to be make in preparing a design. Documentation of an engineering design providing computations and rationale for decisions is good practice and facilitates efficient third party review of designs.

This guide sets out some of the key information that could be expected in a design report for a landfill cell or cap. It is not possible provide foresee everything that is needed in design report for a landfill cell or cap. This document provides a typical table of contents for a design report and some of the common design issues that should be included in a design report.

Every cell or cap design is unique. While there will be many common elements between designs, it is necessary for the designer to consider each element of the design with respect to the site setting, the geometry of the cell, waste types and the manner in which the lining systems and leachate systems are combined. A design report should demonstrate the rationale behind each design element and demonstrate how the design complies with BPEM.

The information provided below is based on typical requirements for design of landfill cells. Many of the elements are also relevant to cap design.

**Note: the content for this Appendix 13 has been provided by the Landfill Auditor Steering Group that consists of environmental auditors who undertake landfill audits in Victoria.**

### Table of contents for landfill cell design

Introduction
Background and Waste Stream
Subgrade (floor and walls)
Liner System
Leachate Collection System
Sumps
Water Management
Operational Constraints
Cap Concept
Safety in Design
Variation from BPEM
Risk Assessment

### Typical design matters to be included in design report

Landfill cell design component	Detail to be included in report
<b>Subgrade</b>	Geotechnical/hydrogeological investigation
	Strength
	Settlement
	Depressurisation (lowering of water table)
<b>Liner system</b>	Percolation
	Selection of materials
	Design of compacted clay liner (CCL)
	<ul style="list-style-type: none"> <li>Settlement and impact of deformation</li> </ul>

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	Design of geosynthetic clay liner (GCL) if any
	<ul style="list-style-type: none"> <li>• Materials selection and testing</li> </ul>
	<ul style="list-style-type: none"> <li>• Equivalency</li> </ul>
	<ul style="list-style-type: none"> <li>• Settlement and impact of deformation</li> </ul>
	Geomembrane
	<ul style="list-style-type: none"> <li>• Material selection</li> </ul>
	<ul style="list-style-type: none"> <li>• Wind uplift</li> </ul>
	<ul style="list-style-type: none"> <li>• Deformation/strain performance</li> </ul>
	<ul style="list-style-type: none"> <li>• Welding constraints (e.g. new to old membrane)</li> </ul>
	<ul style="list-style-type: none"> <li>• Placement of drainage layer (prevention of damage)</li> </ul>
	Slope stability assessment
	<ul style="list-style-type: none"> <li>• Interface friction testing</li> </ul>
	<ul style="list-style-type: none"> <li>• Static</li> </ul>
	<ul style="list-style-type: none"> <li>• Seismic</li> </ul>
	Anchor Trench Design (pull out)
	Cushion Geotextile Design
	<ul style="list-style-type: none"> <li>• Compression testing</li> </ul>
	<ul style="list-style-type: none"> <li>• Puncture design</li> </ul>
<b>Leachate collection system</b>	Aggregate permeability
	Aggregate placement
	Pipe spacing
	Pipe strength
	Pipe hydraulic capacity
<b>Separation geotextile</b>	Strength
	UV performance
<b>Leachate Sump</b>	Depends on type
	Material selection and performance
	Strength
	Foundation design including dragdown
	Pumping system design
<b>Water Management</b>	Groundwater separation
	Surface water management
	<ul style="list-style-type: none"> <li>• In cell</li> </ul>
	<ul style="list-style-type: none"> <li>• Clean water</li> </ul>

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	Leachate management
	<ul style="list-style-type: none"><li>• Leachate water balance</li></ul>
	<ul style="list-style-type: none"><li>• Capability of existing system</li></ul>
	<ul style="list-style-type: none"><li>• Design of new system</li></ul>
	Landfill gas management
	<ul style="list-style-type: none"><li>• Expansion of existing system</li></ul>
	<ul style="list-style-type: none"><li>• Concept design for new system</li></ul>
<b>Operational issues</b>	Constraints on waste placement
	<ul style="list-style-type: none"><li>• Prevention of liner damage</li></ul>
	<ul style="list-style-type: none"><li>• Maintenance of stability</li></ul>
	Access and trafficability
<b>Cap concept</b>	Surface water management
<b>Variation from BPEM</b>	Risk assessment
<b>Safety in design</b>	

## Appendix 14: Scope of assessment by environmental auditor of technical specifications and CQA plan

The first formal involvement of an environmental auditor in the landfill cell approval process is during assessment of the technical specifications and construction quality assurance (CQA) plan for the new landfill cell. The assessment by an environmental auditor would be conducted using an approach deemed suitable by the environmental auditor.

The outcome of the assessment is a declaration (see Appendix 15) that the technical specification and CQA plan contain adequate information of a suitable quality to assess whether the documents meet EPA's requirements set out in relevant guidelines published by EPA and ensure the cell is constructed in accordance with the design.

### A14.1 Assessment objective

The assessment is intended to determine whether the technical specifications and CQA plan, prepared for the new landfill cell, provide sufficient detail to adequately manage environmental risks that may arise during cell construction and operation and ensure the cell is constructed in accordance with the design. The assessment will include a qualitative risk assessment of the new landfill cell.

The assessment is limited to consideration of the contents of the technical specifications and CQA plan for the new landfill cell. The environmental auditor may make recommendations for improvement of the documents.

### A14.2 Conducting the assessment

The assessment must be tailored to the subject landfill and would be conducted in a manner deemed appropriate by the environmental auditor and would typically comprise an assessment of consistency of the plans, technical specification and the CQA plan for the proposed cell with the requirements of the Landfill BPEM and Appendices 9, 10 and 11.

Where the licence-holder proposes an element of landfill cell design or standard that varies from the Landfill BPEM, the environmental auditor must conduct an equivalence test to assess whether the proposed design or standard would provide a level of environmental protection that meets or exceeds Landfill BPEM specifications. The equivalence test would take the form of an assessment of risk to the environment.

### A14.3 Key considerations

During planning of the assessment, the environmental auditor should prepare a detailed assessment plan that includes consideration of the following matters:

- the overall basis of the landfill cell design
- the general method of cell construction including any side wall drainage layer construction in stages (lifts)
- the manner in which the cell will be filled
- consistency of the technical specifications and CQA plan with Landfill BPEM requirements, industry best practice and, where appropriate, consideration to low-risk landfill sites (see Appendix 3)
- details of proposed measures to protect groundwater from leachate seepage.

### A14.4 Environmental assessment report

The environmental assessment report for this assessment must clearly state the environmental auditor's opinion as to the risks posed by the proposed landfill cell to the environment. In addition, the report must include details of any equivalence testing undertaken by the auditor and a declaration of whether the risks to the environment associated with the proposed landfill cell are adequately addressed in the technical specifications and CQA plan for the cell.

A copy of each assessment report must be provided to EPA as well as the landfill licence-holder.

A template for the assessment declaration is provided in Appendix 15.

## Appendix 15: Format for environmental auditor declaration of technical specifications and CQA plan assessment

I,.....of....., an environmental auditor (appointed pursuant to the Environment Protection Act 1970; 'the Act'), having:

1. been requested by .....('the licence-holder') to assess that the technical specifications and CQA plan prepared for the site located at

.....

EPA licence number ..... ('the site')

for the purposes of construction of a proposed landfill cell ('the works'),

2. having had regard to, among other things (list relevant policies):

.....

.....

and the following relevant documents (these may be documents published by the Authority or other relevant bodies such as guidelines, codes of practice etc):

.....

.....

3. considered the following documents:

- (i) landfill cell technical specifications;
- (ii) landfill cell construction quality assurance plan;

.....

4. assessed the landfill cell technical specifications and construction quality assurance plan:

.....

.....

.....

.....

.....

.....

.....

.....

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HEREBY DECLARE that I am of the opinion that:

- i) the attached plans, technical specifications and CQA plan (list documents assessed):

.....  
.....  
.....

contain adequate information of suitable quality to meet the Authority's requirements (i.e. that the technical specifications and CQA plan for the proposed works would not be contrary to, or inconsistent with, any applicable policy, likely to cause or contribute to pollution, or likely to cause an environmental hazard and enable the landfill cell to be constructed in accordance with the design).

and

- ii) the Authority's requirements would be complied with should the works proceed.

Other relevant information

.....  
.....  
.....  
.....  
.....

DATED

Signed:

ENVIRONMENTAL AUDITOR (APPOINTED PURSUANT TO THE ENVIRONMENT PROTECTION ACT 1970)

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## Appendix 16: Format for submission of performance specifications, CQA plan and environmental auditor assessment declaration

[Date]

Program Manager – Environmental Audit

EPA Victoria

GPO Box 4395

MELBOURNE, 3001

I, ....., an authorised representative of

..... (the licence-holder)

propose to construct a new landfill cell at the licensed premises located at

.....

Details are as follows.

Licence number

Licence-holder

Proposed landfill cell number

Name of person submitting documents

Relationship to premises

Premises name

Street number

Street name

Suburb

Postcode

Commencement date for works

Completion date for works

I have enclosed:

1. the technical specifications for the proposed landfill cell
2. the construction quality assurance plan for the proposed landfill cell
3. the environmental auditor assessment declaration.

Yours sincerely

[Name in full]

.....  
[Position in landfill company]

[Licence-holder name]

Representative of EPA Licence No. [\_\_\_\_\_]

## Appendix 17: Criteria for assessment of technical specifications and CQA plan by EPA

The following criteria will be applied during assessment by EPA of the submitted technical specifications and CQA plan:

1. Conclusions and recommendations of the environmental auditor provided in the plans, technical specification and CQA plan assessment report.
2. Environment Protection Act 1970.
3. Relevant State environment protection policies.
4. Existing EPA licence for the premises.
5. Council planning permit conditions.
6. Landfill environment improvement plan.
7. Best practice environmental management — Siting, design, operation and rehabilitation of landfills, EPA Publication 788.
8. Waste Management Policy (Siting, Design and Management of Landfills).
9. Any other publications deemed relevant by EPA.

## Appendix 18: Cell construction audit scope

Cell construction audits must follow the method specified in Environmental auditor guidelines for the preparation of environmental reports on risk to the environment (EPA Publication 952). The objective and scope of the cell construction audit is specified below.

### A18.1 Audit objective

The objective of the audit is to identify whether the construction of the new landfill cell has been conducted in accordance with the EPA-approved technical specifications and CQA plan. It also checks whether there have been any variations to the approved design, to determine the risk of any possible harm or detriment to a segment of the environment caused by those variations.

### A18.2 Audit scope

#### Activity to be audited

The activity to be audited is the construction of a new landfill cell.

#### Component of the activity to be considered

The audit will assess all stages of cell construction, from confirming an appropriate sub-grade preparation to completion of the upper layer of the leachate collection and drainage layer onto which wastes will be placed. The audit scope must clearly identify where a component of a landfill cell (in particular side wall drainage layer) is designed to be constructed in more than one lift.

#### Segment of the environment to be considered

The segment of the environment to be considered during the audit will be the area of the landfill in which the new cell is being constructed and the environment surrounding the landfill to which the activity may pose a risk. If the audit is to verify only a component of the cell, it should be clearly identified in the audit report. This is particularly important for progressive (successive) construction of side walls or vertical lifts. In such circumstances, a cross-sectional map showing the auditing area with appropriate heights would be required.

#### Elements of the environment to be considered

The audit will consider groundwater, surface water, land and atmosphere.

#### Beneficial uses to be considered

Beneficial uses to be considered during the audit will be those specified in the State environment protection policies to be identified by the environmental auditor.

#### Risk assessment to be conducted

The audit will include a qualitative or semi-quantitative assessment of the risks associated with construction of the new landfill cell. The method of risk assessment would be determined by the environmental auditor.

#### Period of time over which the audit is to be conducted

The audit would address activities that occur from the date of commencement of landfill cell construction to the date of completion of landfill cell construction. Where a landfill cell has been designed to be constructed in more than one stage — in other words, the side wall drainage layer is constructed in more than one lift — the anticipated dates for audit of construction of each lift must be provided.

#### Exclusions from the scope of the audit

The audit is limited to consideration of the construction of the new landfill cell. The environmental auditor may make recommendations for matters to be included in the monitoring program to be prepared for the cell.

### A18.3 Audit criteria

Audit criteria may be drawn from the following policies, documents and guidelines:

- Environment Protection Act 1970
- relevant State environment protection policies
- existing EPA licence for the premises
- the EPA-approved technical specifications and CQA plan
- EPA approvals for major variations
- EPA requirements specified in the cell construction approval letter
- Best practice environmental management — Siting, design, operation and rehabilitation of landfills, EPA Publication 788
- Waste Management Policy (Siting, Design and Management of Landfills)
- any other publications deemed relevant by the environmental auditor.

## **A18.4 Conducting the audit**

The audit would be conducted in a manner deemed appropriate by the environmental auditor and would typically include the steps of:

- familiarisation with the project and review of the technical specifications and CQA plan
- inspection of the proposed landfill cell construction area
- detailed inspection of the construction site at the time of each hold point and at other times considered necessary by the environmental auditor
- consideration of any variations to the approved technical specifications and CQA plan
- assessment of risk to beneficial uses of the segment concerned
- preparation of an environmental audit report consistent with the audit findings
- preparation of an addendum to the audit report with audit findings for each subsequently constructed landfill cell vertical lift.

## **A18.5 Environmental audit report**

The environmental audit report for this assessment would be consistent with section 15.2 of publication 952 and therefore section 53V of the Environment Protection Act 1970.

The report must clearly state the environmental auditor's opinion as to the risks to the beneficial uses of the nominated segments posed by construction of the landfill cell.

The report must include a copy of notifications of minor variation from the licence-holder to EPA and approvals for major variations from EPA.

In common with all audit reports, the audit must have an EPA-issued CARMS number on the cover for identification and a copy of each report must be lodged with EPA.

Where a landfill cell component (i.e. side wall drainage layer) is designed to be constructed in more than one vertical lift, the auditor must complete an addendum to the audit report for the construction of each vertical lift. Each addendum must clearly state the environmental auditor's opinion as to the risks to the beneficial uses of the nominated segments posed by the landfill cell as a result of the construction of the landfill cell lift. A copy of each addendum must be lodged with EPA consistent with section 15.1 of Publication 759.

## Appendix 19: Criteria for determining degree of variation

Criteria to assist with identification of the degree of variation from the technical specifications for a proposed landfill cell are indicated in the following table.

Criterion	Minor variation	Major variation
Potential environmental risk from the variation	Unchanged or reduced	Increased An environmental risk assessment of the variation has not been conducted
Size or capacity of landfill cell	Less than 10% change	Change of 10% or more
Construction material	Proposed construction material has been shown to provide better environmental protection than that originally proposed	Proposed construction material does not provide better environmental protection than that originally proposed
Construction method	The change does not involve a modification of the approved design, technical specifications or CQA plan	The change involves a modification of the approved design, technical specifications or CQA plan
Technical specification	The change in specification is consistent with the Landfill BPEM	The change in specification is contrary to the Landfill BPEM
Leachate collection, treatment or disposal	–	A change of the method of leachate collection, treatment or disposal
Material performance standards	–	A reduction in material performance standards
Design change	Variation of the liner slope, where additional measures are provided for leachate collection	Variation to the liner slope where additional measures are not proposed
Design change	Placement of temporary stormwater diversion bunds within the cell to minimise the operational/tipping area to reduce or manage stormwater flows	
Design change		Divide the cell into two or more sub cells
Design change		Change the location of the leachate collection sump
Design change/construction process/procedure change		To address any rectification work to the liners, undertake and replacement work for the liner system etc.
Construction change		To address unforeseen circumstances, site circumstance change etc.
Design change		Barrier system change

## Appendix 20: Progressive rehabilitation

### Progressive rehabilitation

Progressive rehabilitation of a landfill involves the closure and rehabilitation of each cell once filling has been completed during the operating life of the landfill.

These works are effectively a staged closure of the landfill that occurs while the active cell is being filled. Landfill cell rehabilitation works include:

- capping and revegetation in accordance with regulatory requirements and the Landfill BPEM
- capping in accordance with EPA approved design
- installation and ongoing maintenance and replacement of gas and leachate collection infrastructure
- decommissioning of infrastructure no longer required.

Environmental and management benefits of progressive rehabilitation include:

- collection and treatment of landfill gas during its peak generation period
- minimising the generation of leachate and offensive odours
- facilitating materials budgeting through the staged use of capping materials over the life of the landfill
- achieving cost recovery during the economic life of the landfill
- meeting financial assurance requirements (see Determination of Financial Assurance for Landfills, EPA Publication 1596).

### Triggers for rehabilitation

Implementation of the progressive rehabilitation at a landfill should be consistent with the conceptual rehabilitation plan prepared during the initial landfill design.

A landfill licence-holder should, where operationally practicable, sequence operations to complete the filling of each cell in turn, rather than leaving one or more partly filled cells inactive and not fully rehabilitated.

Where cells cannot be fully rehabilitated due to the layout of the site and the sequencing of filling, intermediate (temporary) capping must be installed.

In order to take best advantage of its inherent benefits, rehabilitation of a landfill cell should be initiated once:

- the landfill cell contents have reached the approved pre-settlement contours, allowing sufficient height to build the landfill capping within the pre-settlement contours
- further filling of the cell is operationally no longer required or feasible
- there has been a lawful direction to cease filling the cell
- the landfill is to be closed

or

- two years have elapsed since commencement of filling (Landfill BPEM).

### Audit indicators of progressive rehabilitation

The following indicators may be adopted by the environmental auditor to determine if progressive rehabilitation is being suitably implemented. Where these criteria do not assist assessment of a particular landfill, an environmental auditor may determine whether proactive rehabilitation works are being implemented. Justification for this determination must be included in the audit report.

Progressive rehabilitation is being implemented if:

- all filled cells have been rehabilitated
- planned cell rehabilitation works are underway

or

- the landfill operator can demonstrate that rehabilitation works of a filled cell are programmed for timely commencement.

## Changes made to 1323.2 Landfill Licensing Guidelines

A summary of the changes made to the previous release of this publication, 1323.2, is provided below.

The main changes to this document have been made in Appendix I to reflect the new landfill licence conditions and to provide supporting text for these conditions. Minor modifications in other parts of the text have been made for consistency with the changes in Appendix I.

Section	Changes
Introduction	Edits to the “Introduction” to explain the changes in the guidelines
Section A Part 2	Edits to “Environmental monitoring program” in relation to leachate management
Table 1	Additional wording relating to definition of audit priorities and table of definition
APS	Additional requirement for APS
Appendix 1	Additional and new text for A1, A2 and A3 and L1 – L28 to reflect new licence conditions
Appendix 7	More detail on the requirements for premises and contour plans
Appendix 9	Insertion of new <b>Appendix 9:Preparation of plans (designs) for a new landfill cell</b> and subsequent renumbering of appendices
Appendix 13	Insertion of new <b>Appendix 13:Design Report Requirements</b> and subsequent renumbering of appendices
Appendix 19	More detail on what constitutes a major variation