



#### INSTRUCTIONS:

- This checklist outlines additional information requirements for applications under Part V Division 3 of the *Environmental Protection Act 1986* (EP Act) to:
  - construct and operate new solid waste landfills, or
  - amend an instrument granted for an existing landfill (i.e. new cells/landfill areas at an existing landfill facility).
- This checklist must be completed and submitted as an attachment to the main 'works approval, licence or amendment [application form](#)' (see Part 12 of that form). Notes included throughout this checklist must be read in conjunction with the instructions and requirements of the main application form.
- The application checklist must be completed with all relevant information attached. Information requirements and attachments can be combined and submitted as one or more consolidated documents if desired, provided it is clear to which section of the application checklist the information/attachments relate.
- If an application form and checklist has been submitted and are incomplete the Chief Executive Officer (CEO) of the Department of Water and Environmental Regulation (DWER) will decline or return the application (as applicable).
- The information requirements outlined in this checklist are not exhaustive. Applicants are advised to provide additional supporting information and environmental investigations as required to support the application and assessment process.
- This checklist does not apply to landfill sites that are associated with mining operations or for rural landfill premises (premises specified in Schedule 1 Part 2 of the Environmental Protection Regulations 1987 as category 89 premises).
  - However, depending on the environmental context of the proposed landfill site, DWER may still require applicants to provide a similar level of detail to support their application. Mine site and rural landfill operators should consider the environmental siting of the proposed landfill site and, depending on the site sensitivity, should contact DWER to seek advice on the likely specific information requirements, prior to submitting an application.

#### Completion matrix

The matrix below explains what sections are required to be completed for different types of landfill applications. The class and category of landfill is outlined in Schedule 1 of the Environmental Protection Regulations 1987.

Form section	Prescribed premises category and landfill class				
	Category 63	Category 64	Category 64	Category 65	Category 66
	Class I	Class II	Class III	Class IV	Class V
<a href="#">Part 1: Environmental siting and Conceptual Site Model</a>	•	•	•	•	•
<a href="#">Part 2: Landfill design and construction</a>	•	•	•	•	•
<a href="#">Part 2A: Design and construction overview</a>	•	•	•	•	•
<a href="#">Part 2B: Landfill liner specifications</a>	N/A	•	•	•	•
<a href="#">Part 2C: Stability assessment</a>	N/A	•	•	•	•
<a href="#">Part 2D: Leachate management</a>	N/A	•	•	•	•
<a href="#">Part 2E: Landfill gas management</a>	N/A	•	•	•	•
<a href="#">Part 2F: Stormwater/surface water management</a>	•	•	•	•	•
<a href="#">Part 2G: Monitoring requirements</a>	•	•	•	•	•
<a href="#">Part 3: Premises operations</a>	•	•	•	•	•
<a href="#">Part 4: Landfill closure and rehabilitation</a>	•	•	•	•	•

#### Key:

- Must be submitted
- N/A Not required with application, or not applicable in the context of the scope of works and operations.

Part 1: Environmental siting and conceptual site model (CSM)	
<b>INSTRUCTIONS:</b> <ul style="list-style-type: none"> <li>Refer to DWER's <a href="#">Guideline: Environmental siting</a> for details of the specified ecosystems and other environmental attributes considered in DWER's assessment.</li> <li>The supporting information provided as part of an application must provide sufficient evidence to allow DWER to make a reasonable decision.</li> </ul>	
	Yes
<b>1.1 Siting context and background</b> Provide a description of: <ul style="list-style-type: none"> <li>history of the site (past and current activities)</li> <li>land ownership</li> <li>the local area and the landfill's siting within this area</li> <li>surrounding land uses</li> <li>community and/or stakeholder need for landfill site.</li> </ul>	<input checked="" type="checkbox"/>
<b>1.2 Sensitive receptors and designated areas (within a 2 km radius<sup>1</sup>)</b> Provide information on the distance and directions to sensitive environmental and human receptors including: <ul style="list-style-type: none"> <li>human receptors (e.g. residential, rural, industrial / commercial, and/or recreational premises)</li> <li>surface waters (permanent and seasonal)</li> <li>depth to groundwater and potential beneficial use(s)</li> <li>sensitive flora and fauna</li> <li>designated areas<sup>2</sup></li> <li>regional and local catchment characteristics.</li> </ul> And other sensitive receptors as identified in the <a href="#">Guideline: Environmental siting</a> . Note 1: depending on the proposed landfill class and site context, a larger radius may need to be assessed. Note 2: designated areas as defined by section 57 of the EP Act and comprise water source areas proclaimed under the <i>Rights in Water and Irrigation Act 1914</i> , and Public Drinking Water Source Areas proclaimed under the <i>Country Areas Water Supply Act 1947</i> and <i>Metropolitan Water Supply, Sewerage, and Drainage Act 1909</i> .	<input checked="" type="checkbox"/>
<b>1.3 Local climate and meteorological data</b> Provide information on the local climate and meteorological data, including: <ul style="list-style-type: none"> <li>monthly rainfall</li> <li>monthly evaporation</li> <li>wind conditions (seasonal wind strength and direction)</li> <li>source and date range of meteorological data (e.g. on-site weather station or from a Bureau of Meteorology [BoM] site; site details must be provided).</li> </ul>	<input checked="" type="checkbox"/>
<b>1.4 Topography, geology and hydrology</b> Provide information on the topography, geology and hydrogeology of the area including: <ul style="list-style-type: none"> <li>surface elevation and topography</li> <li>regional and local geology<sup>3</sup> and soils<sup>3</sup> including site-specific soil and geological records where available</li> <li>regional and local hydrology</li> <li>groundwater flow direction and rate<sup>3</sup></li> <li>groundwater quality<sup>3</sup> and current or future use</li> <li>groundwater aquifer characteristics</li> <li>a description of geologic active processes (e.g. faulting, subsidence) (if applicable).</li> </ul> Note 3: site-specific investigations should be undertaken where information on local attributes is not available in published documentation or digital datasets. Whether relying on published information or the results of site investigations, applicants must provide references and demonstrate that the information presented is representative of site conditions.	<input checked="" type="checkbox"/>

Part 1: Environmental siting and conceptual site model (CSM)				
1.5	<b>Conceptual site model</b> Provide a site-specific conceptual site model (CSM) <sup>4</sup> which clearly identifies all potential source-pathway-receptor (S-P-R) linkages for all related environmental media (Section 1.8 below – Attachment 3).  The development of the CSM is an iterative process, whereby the initial CSM is developed in the first stage of conceptual design/assessment (taking into consideration the nature of baseline environmental conditions) and revised as more detailed information on the site and the nature of potential risk events becomes available. The CSM is also used to identify uncertainties or critical gaps in information that may need to be addressed through additional investigations.  The complexity of the CSM corresponds to the scale and complexity of the landfill activities and should be devised to help in the design process to identify appropriate design and operational measures as well as environmental monitoring requirements.  Note 4: guidance on developing CSM's can be sourced in DWER's <a href="#">Assessment and management of contaminated sites guidelines</a> and from Schedule B2 of the <a href="#">National Environment Protection (Assessment of Site Contamination) Measure 1999</a> (NEPM).			<input checked="" type="checkbox"/>
<b>Attachments</b>			<b>N/A</b>	<b>Yes</b>
1.6	<b>Attachment 1: Locality map(s)</b>	An aerial photograph, map, and/or site plan of sufficient scale showing the proposed prescribed premises boundary and general locality of the premises in respect to nearby sensitive receptors and surrounding land uses.  Multiple maps at different scales can be provided.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1.7	<b>Attachment 2: Topography, geology and hydrogeological plans/maps</b>	An aerial overview and cross-section drawings of topographical, geological, and hydrogeological features related to the site.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1.8	<b>Attachment 3: Conceptual site model</b>	In accordance with Part 1.5 above, provide a CSM in table format. A graphical representation can also be developed and submitted to help illustrate S-P-R linkages. An example table format is provided below.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Example CSM table:</b>				
<b>Source / activities</b>	<b>Pollutant or contaminant of potential concern</b>	<b>Pathway (transport mechanism)</b>	<b>Receptor</b>	<b>Potential impacts</b>
Leachate Pond 1	Metals, TDS, nutrients, BOD, organic acids, petroleum hydrocarbons, sulfides, alkanes, PFAS	Infiltration; vertical migration to the subsurface and groundwater.  Horizontal migration in groundwater along the downgradient flow path.  Abstraction of groundwater for non-potable uses (garden irrigation and other non-potable uses).	Underlying groundwater (15mBGL).  Down-hydraulic gradient non-potable groundwater users – 8 licensed bores identified, unlicensed domestic bores may also be present (400m south-west).  Conservation category wetland located down-hydraulic gradient (300m south-west) – considered a 'flow-through wetland' which is in direct hydraulic connection with the water-table aquifer.	Groundwater degradation and impacts to downgradient groundwater users.  Impacts to wetland water quality and ecosystem disturbance.
Landfill	Landfill gas	Subsurface lateral migration along preferential pathways.	On-site office administration accommodation 150m from the proposal landfill cell.	Accumulation of LFG in subsurface structures and conduits presenting a potential explosion hazard.

**Part 2: Landfill design and construction****INSTRUCTIONS:**

- This section is made up of 7 sub-parts focusing on landfill design and construction:
  - Part 2A: Design overview and construction scope
  - Part 2B: Landfill liner specifications
  - Part 2C: Stability assessment
  - Part 2D: Leachate management
  - Part 2E: Landfill gas management
  - Part 2F: Stormwater/surface water management
  - Part 2G: Monitoring requirements
- The proposed design should consider and acknowledge the interactions between these elements and take into consideration the environment setting, adjacent current and future land uses, available materials and infrastructure, waste to be received and the need to provide integrated waste management facilities (disposal and recycling options).
- The CSM (required under Part 1.5) will help operators in gaining an understanding of the environmental setting and potential risk events and should be considered in the design and operation of the landfill.
- Where an application is for a category 63 (Class I landfill), but not any other landfill category, only sub-parts 2A, 2F, and 2G must be completed; Parts 2B to 2E are either optional or not applicable.

**Part 2A: Design overview and construction works****INSTRUCTIONS:**

- This section requires applicants to provide an overview of the proposed landfill design concept including all related infrastructure, such as leachate and landfill gas management infrastructure.
- This section also requires a detailed summary of the extent of construction works that are being proposed under this application to clarify the scope of assessment.

	Yes
<p><b>2.1 Landfill design concept</b></p> <p>Provide information on each component of the proposed landfill including (but not limited to):</p> <ul style="list-style-type: none"> <li>• landfill type and design concept: including details on size (spatial and volumetric), lifespan, geometry, proposed liner<sup>5</sup> and leachate management system<sup>5</sup> and groundwater and surface water management<sup>5</sup> (specified design detail must be provided for each proposed landfill cell)</li> <li>• waste types proposed for disposal<sup>6</sup></li> <li>• details on the landfill cell(s) that will be subject of this application and staging of development</li> <li>• site infrastructure layout including details on traffic access and internal haul routes, and details on all facilities for receiving and handling waste and administration of the landfill.</li> </ul> <p>Note 5: Only an overview of this information is required under this part. Specific information requirements for each of these aspects is outlined further in subsequent parts of the application checklist.</p> <p>Note 6: Information must be consistent with the requirements outlined in Part 9.2 of the main works approval or licence application form (waste-related activities).</p>	☒
<p><b>2.2 Scope of construction works</b></p> <p>Provide details of construction works including:</p> <ul style="list-style-type: none"> <li>• general site preparation works<sup>7,8</sup></li> <li>• infrastructure to be constructed</li> <li>• construction phases and associated timings of works</li> <li>• construction quality assurance (CQA) measures and procedures to be employed<sup>9</sup></li> <li>• summary of management measures and controls to be adopted for noise, dust and odour emissions (odour in the case where new cells are tying in with existing cells) and for the management of stormwater, general erosion and sediment control<sup>10</sup></li> </ul> <p>Note 7: Certain site preparation works may be undertaken without a works approval. Refer to Section 3 of the <a href="#">Guideline: Industry Regulation Guide to Licensing</a> for further information.</p> <p>Note 8: Provide a general overview of site preparation works. Specific preparatory works in relation to the landfill liner, leachate pond and landfill cap are detailed respectively in Part 2B, Part 2E, and Part 4.</p> <p>Note 9: Part 2B of this checklist outlines specific CQA information requirements for the liner installation. It is essential that you adopt a quality approach to landfill engineering. CQA techniques help in providing confidence that construction works have been completed in accordance with the design specifications and, where non-conformances are identified, that appropriate corrective actions are taken. Typically for landfill applications, applicants should provide a CQA plan prepared in conjunction with design engineers and relevant CQA specialists.</p>	☒

Part 2A: Design overview and construction works		
Note 10: Information must be consistent with the requirements outlined in Part 9.1 of the main works approval or licence application form (potential emissions and discharges arising from the proposed activities).		
Attachments		Yes
2.3	<b>Attachment 4: Premises map and site layout plan(s)</b> A premises map and site layout plan must be provided, which include the following: <ul style="list-style-type: none"> <li>premises boundary</li> <li>site layout depicting all infrastructure (current and proposed)</li> <li>location of the works (cells, leachate ponds, etc.) and any potential future cells/ponds (as applicable)</li> <li>stormwater infrastructure</li> <li>access and haulage roads</li> <li>other key buildings (gatehouse, weighbridge, administration office, etc.)</li> <li>scale and north arrow; GPS coordinates and legend.</li> </ul>	<input checked="" type="checkbox"/>
2.5	<b>Attachment 5: Detailed design drawings (multiple as required)</b> Detailed design drawings: <sup>11</sup> <ul style="list-style-type: none"> <li>cell layout</li> <li>landfill geometry</li> <li>schematic cross sections of the landfill cell(s)</li> <li>leachate pond layout and cross sections</li> <li>landfill cap.</li> </ul> Note 11: Additional design drawings are required for the proposed liner, leachate management system and landfill cap as detailed respectively in Part 2B, Part 2E, and Part 4.	<input checked="" type="checkbox"/>

Part 2B: Landfill liner specifications		
<b>NOTE:</b> <ul style="list-style-type: none"> <li>The principal functions of a landfill liner system are to limit contaminant migration to groundwater and to control landfill gas migration.</li> <li>Construction quality assurance (CQA) measures must be in place to ensure construction of the engineered systems will meet the intended (and assessed) standards and specifications and to provide an audit trail.</li> </ul>		
	N/A	Yes
2.6 <b>Landfill liner system:</b> Provide details of the proposed landfill liner system and configuration. A statement of the intended landfill liner performance (overall permeability and containment features) should also be provided in support of the proposed liner system. Components <sup>12</sup> of the basal and side slope liner may include: <ul style="list-style-type: none"> <li>Subgrade<sup>13</sup></li> <li>Clay<sup>14</sup> or geosynthetic clay liner (GCL)</li> <li>High Density Polyethylene (HDPE) geomembrane</li> <li>leachate drainage layer<sup>15,16</sup></li> <li>cushion geotextile layer.</li> </ul> Provide detailed design drawings of the liner system (see Section 2.9 – Attachment 6). Note 12: Thickness, material properties and manufacturer design specifications (including design hydraulic conductivity/permeability) must be provided for each liner component. Note 13: Where the in-situ subgrade is not suitable to form part of the foundation and liner, then an appropriate sub-grade must be constructed. Note 14: Where a natural geological barrier is in place (and forms part of the liner system) you must demonstrate that the barrier extends along the base and all the way up the sides of the landfill site. Details of the in-situ thickness, material properties and any artificial enhancements must be provided. Note 15: Part 2D of this checklist outlines specific information requirements for leachate management (which complement the detail requested in this section). Note 16: Operators may consider the need for a secondary leachate collection system (leak detection layer) to detect any malfunction of the upper primary liner components.	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Part 2B: Landfill liner specifications				
2.7	<b>Liner construction and/or installation:</b> Provide information of the proposed construction and/or installation of the liner system. Information should be provided for each individual liner component (as the case requires). Considerations include, but are not limited to: <ul style="list-style-type: none"> <li>any preparatory works required, e.g. earthworks/subgrade preparation, compaction methods</li> <li>handling and storage of liner materials</li> <li>method of placement (for clay liners include details of thickness and number of lifts, compaction method and required level of compaction)</li> <li>keying into existing surfaces (anchor points) and/or tying into adjacent landfill cells</li> <li>conditions of underlying surface between layers</li> <li>method of jointing for liner installation (e.g. bonding, welding, or seaming)</li> <li>quality assurance testing (see Section 2.8 below).</li> </ul>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
2.8	<b>Construction Quality Assurance plan</b> The application should include a Construction Quality Assurance (CQA) plan which includes the proposed testing, inspection, and verification procedures to demonstrate that materials and constructed features at the landfill meet the designs and specifications. The CQA plan should include as a minimum: <ul style="list-style-type: none"> <li>descriptions of responsibilities, qualifications and obligations for each party involved in the CQA plan and the proposed level of supervision for liner construction/ installation</li> <li>materials testing information, including sampling locations, frequency of testing, test methods, laboratories, accreditations, applicable specifications and quality standards, data evaluation, acceptance and rejection criteria, and contingency measures in the event of failure</li> <li>hold and inspection points – these points are typically the start and finish of key stages of the work that cannot later be rectified because they will no longer be accessible</li> <li>for geosynthetic materials (i.e. geomembranes, geosynthetic clay liners, geotextiles, geonet drainage geocomposites, and geogrids), the CQA plan should address the following requirements:               <ul style="list-style-type: none"> <li>manufacturing quality control – including factory test results, certifications and material warranties</li> <li>independent conformance testing – there should be a program of CQA independent conformance testing to verify that the materials supplied comply with the required specifications</li> <li>installation procedures – storage to protect from weather and other damage during installation, panel overlaps, welds, jointing and seam orientation in accordance with good practice and the manufacturer's instructions and regular inspections, repairs tested and recorded and protection from UV light after installation etc.</li> </ul> </li> <li>reporting<sup>17</sup> and record keeping requirements.</li> </ul> Note 17: As part of validating landfill construction works, DWER will require operators to submit a Critical Containment Infrastructure Report (CCIR). The purpose of the CCIR is to confirm that the environmental controls on containment infrastructure are properly constructed before materials are deposited in the containment cell (the CCIR is the equivalent of a CQA validation report which have historically been required for verification and audit purposes).		<input checked="" type="checkbox"/>	<input type="checkbox"/>
<b>Attachments</b>			<b>N/A</b>	<b>Yes</b>
2.9	<b>Attachment 6: Detailed design drawings – landfill liner</b>	Provide detailed design drawings which clearly depict the following:		
		a) basal and side wall liner detail (typical section)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		b) leachate sump liner detail (typical section)	<input checked="" type="checkbox"/>	<input type="checkbox"/>



Part 2B: Landfill liner specifications		
<p>c) inferred groundwater levels (mAHD) relative to the base of the landfill cell (mAHD); depicted on cross-section drawings (showing at least two perpendicular planes on the horizontal, e.g. north-south, east-west, or otherwise as appropriate) showing perimeter side slopes/walls. All heights of the base, sump, liner, and the perimeter side walls should be shown in mAHD.</p> <p>Cross sections must clearly demonstrate the separation distance between the lowest point of the landfill cell or leachate sump (whichever is lowest) and the underlying water table.</p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
d) leachate collection system, depicting the distribution and layout of leachate collection pipes, sumps, leachate extraction/removal pipes with appropriate grades/slopes etc.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
e) anchor trench detail	<input checked="" type="checkbox"/>	<input type="checkbox"/>
f) liner tie in detail and interface between adjacent cells (if required)	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Part 2C: Stability assessment		
<p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>The geotechnical stability of the lining system, wastes and underlying geological strata (foundation) must be assessed.</li> <li>The stability assessment should take into account the interactions between the multiple layers present in the lining system and must demonstrate structural/physical stability over the entire lifecycle of the landfill.</li> <li>Where DWER has previously assessed stability assessments for existing cells, which were considered appropriate, and the proposed new cells comprise a similar design then the applicant can justify a lower level of stability analysis to that outlined below. In this case the applicant must provide clear justification as to the level of analysis undertaken and give regard to and justify the applicability of previous assessments carried out to the new proposed landfill area/cell.</li> </ul>		
	N/A	Yes
<p>2.10 <b>Stability assessment</b></p> <p>Provide a stability assessment which analyses the following aspects as a minimum:</p> <ul style="list-style-type: none"> <li>liner interface stability <ul style="list-style-type: none"> <li>a) assessment of the capping liner system (upper surface and slopes)</li> <li>b) assessment of the basal liner system interfaces</li> </ul> </li> <li>waste stability</li> <li>embankment slope and foundation stability.</li> </ul> <p><u>Other information requirements:</u></p> <p>The software used and chosen model must be detailed and justified and all assumptions and data inputs must be clearly documented and justified.<sup>18</sup></p> <p>All adopted factors of safety (FoS) must be clearly documented and justified.</p> <p>Details of the material properties used in the analysis must be provided. Where material properties are not based on site-specific investigations,<sup>19</sup> clear justification must be provided to demonstrate that they are appropriate for use in the stability assessment.</p> <p>The assessment must include the elements with the highest risk of instability (critical surfaces) based on interface properties, geometry, sequence of deposition of the waste and subsurface conditions. Interim construction/filling stages must be analysed if the geometry, loading conditions and materials are of risk. Indicate the location of the sections analysed on an appropriate figure and provide justification for why specific elements have been selected (see Section 2.11 – Attachment 7).</p> <p>Confirm the design assumptions regarding internal leachate phreatic surfaces and external pore pressures for the stability analysis and model the scenarios that account for a build-up of pore water pressure in the lining system and waste during normal and abnormal operations as well as post-operations. At a minimum, the following three internal leachate scenarios must be addressed:</p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Part 2C: Stability assessment		
	<ul style="list-style-type: none"> <li>no phreatic surface</li> <li>elevated phreatic surfaces representing hypothetical 'steady state' condition</li> <li>high phreatic surface representing a malfunction of the leachate pumps.</li> </ul> <p>For external pore-pressure scenarios, where relevant, the model should consider both average/expected pore pressure condition and highest inferred groundwater level.</p> <p>A stability analysis must also be performed for pseudo-static conditions to address the effect of a seismic event. The following scenarios must be assessed:</p> <ul style="list-style-type: none"> <li>operation basis earthquake (OBE)</li> <li>maximum design earthquake (MDE)</li> <li>maximum credible earthquake (MCE).</li> </ul> <p>Methods for determining return period intervals for each scenario must be clearly documented and justified.</p> <p>A sensitivity analysis must also be carried out for the basal liner system interface to assess the effect of variability of material properties on the stability analysis outcomes.</p> <p>Note 18: Raw and model data (including modelling files) is not required to be submitted at the time of application but must be able to be provided, in full, on request, so that the stability analysis can be technically verified if necessary.</p> <p>Note 19: The characterisation of all materials incorporated into the stability assessment must be appropriately described. Site-specific investigations of material properties is recommended in preference to using other data.</p>	
Attachments	N/A	Yes
2.11 <b>Attachment 7: Stability assessment drawings and figures (multiple as required)</b>	Analysis drawings and/or figures including, but not limited to: <ul style="list-style-type: none"> <li>cell layout; aerial overview depicting analysed sections</li> <li>cell cross-sections depicting analysed sections (include analysis results in table on figure)</li> <li>other figures and drawings as required.</li> </ul>	<input checked="checked" type="checkbox"/>

Part 2D: Leachate management		
<p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>Operators must provide information on the proposed leachate management system including the need to recover leachate from landfill cells and store in appropriately sized leachate holding and evaporation ponds.</li> <li>There must be sufficient leachate disposal capacity to prevent the build-up of leachate and an increase in the risks of water pollution and offensive odours.</li> </ul>		
	N/A	Yes
<p><b>2.12 Leachate management system</b></p> <p>Provide a description of the proposed leachate management system<sup>20</sup> and method for managing leachate (e.g. evaporation, treatment, re-circulation). A written summary of all the related infrastructure<sup>21</sup> should be provided as well as depicted on an appropriately scaled site layout plan (refer to Section 2.14 – Attachment 8).</p> <p>Please also provide the following assessment and management detail:</p> <ul style="list-style-type: none"> <li>water balance calculation<sup>22,23</sup> to predict the volume of leachate generation over time and to demonstrate that the proposed system has sufficient capacity to manage leachate volumes over the operational life of the landfill</li> <li>leachate management and proposed monitoring plan, including:               <ul style="list-style-type: none"> <li>maximum head of leachate on the liner surface and leachate sump during operation of the landfill</li> <li>in-cell leachate monitoring, including the operational controls and infrastructure to be used to control the leachate head</li> <li>leachate extraction/pumping system (including details on flow rate)</li> <li>leachate pond management, including details on operational freeboard, mechanical aeration equipment (if required), and pond level alarms</li> <li>proposed leachate quality monitoring program (refer also to Part 2G)</li> <li>contingency plans for leachate management in the event of breakdown of various components.</li> </ul> </li> </ul>	<input checked="checked" type="checkbox"/>	<input type="checkbox"/>



Part 2D: Leachate management			
<p>Note 20: Design information requirements for leachate pond design and construction are outlined in Part 2.13 (below).</p> <p>Note 21: Details of the drainage/collection network infrastructure should include information on sumps, collection and extraction pipework and aggregate. Pipe material specifications, spacing gradients and sizing must be provided.</p> <p>Note 22: The water balance must be designed to account for monthly inputs and outputs to demonstrate that the system will be able to operate in a satisfactory manner throughout the year. Cumulative leachate storage over multiple years of operation under average and wet conditions (at least two consecutive years) should also be factored in.</p> <p>Note 23: Operators should use recognised water balance models to estimate leachate generation such as the <a href="#">Hydrologic Evaluation of Landfill Performance (HELP)</a> model originally published by the United States Environmental Protection Agency and modified by Dr Klaus Berger at the University of Hamburg. The model should account for all predicted leachate inputs and outputs from the leachate management system.</p>			
2.13	<p><b>Leachate pond design and construction.</b></p> <p>Provide details of the leachate pond design, including but not limited to:</p> <ul style="list-style-type: none"> <li>• pond dimensions and volumetric capacity<sup>24</sup></li> <li>• pond liner system: <ul style="list-style-type: none"> <li>○ configuration of pond liner<sup>25</sup></li> <li>○ statement of intended performance (overall permeability and containment features)</li> </ul> </li> <li>• associated leachate conveyance infrastructure and equipment and connection points at the leachate pond(s)</li> <li>• liner construction and/or installation<sup>26</sup></li> <li>• construction quality assurance (CQA) measures to be employed<sup>27</sup>.</li> </ul> <p>Design drawings of the liner system including that of the liner anchor trench must be provided (refer to Section 2.15 – Attachment 9).</p> <p>Note 24: pond design must be determined based on the estimated leachate generation including all inputs and outputs. Refer to water balance requirements in Part 2.12.</p> <p>Note 25: Refer to Part 2A for typical liner components – noting that where the leachate pond liner design differs from the landfill liner design, justification should be provided.</p> <p>Note 26: Refer to Part 2A for construction and installation information requirements for pond liners.</p> <p>Note 27: Refer to Part 2A for CQA requirements – CQA provisions for the pond liner can be incorporated into the same CQA plan.</p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<b>Attachments</b>		<b>N/A</b>	<b>Yes</b>
2.14	<p><b>Attachment 8: Figure/plan – layout of leachate management system</b></p> <p>Provide a layout plan of the leachate management system which clearly depicts all associated infrastructure and equipment. Multiple plans can be provided.</p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.15	<p><b>Attachment 9: Detailed design drawings – leachate pond liner</b></p> <p>Detailed design drawings which clearly depict the following:</p>		
	a) Basal and side wall liner detail (typical section).	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<p>b) Inferred groundwater levels (mAHD) relative to the base of the leachate pond base (mAHD), depicted on cross-section drawings (showing at least 2 perpendicular planes on the horizontal, e.g. north-south, east-west, or as appropriate) showing perimeter side slopes/walls. All heights of the base, liner and the perimeter side walls should be shown in mAHD.</p> <p>Cross-sections must clearly demonstrate the separation distance between the lowest point of the leachate pond and underlying water table.</p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	c) Anchor trench detail.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Part 2E: Landfill gas management		
<b>NOTE:</b> <ul style="list-style-type: none"> <li>Fugitive landfill gas emissions can present a hazard to people and the environment. Landfill gas also contains many odorous trace gases which can cause degradation of amenity of nearby residential and industrial/commercial land uses.</li> <li>Prior to establishing a landfill facility, consideration should be given to the site's ability to control and manage landfill gas emissions.</li> </ul>		
	N/A	Yes
2.16 <b>Landfill gas management system:</b> Provide details of the proposed landfill gas management system including: <ul style="list-style-type: none"> <li>a detailed description of the proposed management system, installation procedures, installation timeline, monitoring, and maintenance procedures, including details on:               <ul style="list-style-type: none"> <li>estimated gas generation rates across the entire lifespan of the landfill<sup>28</sup></li> <li>the containment measures to be implemented to reduce subsurface migration (e.g. installation of appropriate basal and capping liner systems)</li> <li>the collection system (active or passive) and layout of landfill gas piping and extraction wells (vertical or horizontal or both), including details on installation processes and timeframes</li> <li>utilisation of captured gas (e.g. flaring, treatment, and reuse in a system of a combustion)</li> <li>specifications of combustion engines/flares and likely emissions (if relevant)</li> <li>in-waste gas monitoring points, perimeter monitoring bores and associated monitoring program (refer also to Part 2G)</li> <li>contingency plans in the event of breakdown of various components.</li> </ul> </li> </ul> Note 28: Landfill gas generation can be estimated using landfill gas generation models which take account of the potential quantity, rate and composition of the landfill gas generated.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Attachments:	N/A	Yes
2.17 <b>Attachment 10: Drawings and figures – landfill gas management system</b> Design drawings and layout figure(s) of the proposed landfill gas management system including, but not limited to: <ul style="list-style-type: none"> <li>in-cell layout of gas collection infrastructure (aerial and cross-section diagrams should be provided where relevant)</li> <li>overview of associated above-ground gas management infrastructure</li> <li>landfill gas monitoring locations.</li> </ul> Multiple drawings and figures can be provided.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Part 2F: Surface water management		
<b>NOTE:</b> <ul style="list-style-type: none"> <li>The premises must be designed and constructed to ensure that stormwater is diverted away from the landfill cell, leachate pond and other waste handling areas. This may be achieved through the use of surface grade changes, bunding, interceptor drains, piping and other drainage systems.</li> <li>Stormwater which has come into contact with waste materials must be collected and managed as leachate in the leachate management system.</li> </ul>		
	N/A	Yes
2.18 <b>Surface water management<sup>29</sup></b> Provide details on the proposed stormwater management strategies and controls for the landfill premises including, but not limited to: <ul style="list-style-type: none"> <li>diversion of stormwater away from areas containing waste using drainage features, bunds, interceptor drains or other drainage systems</li> <li>details on clean stormwater holding ponds to be constructed (if required); design specifications and an overview of construction works should also be provided</li> <li>details of any proposed controlled releases of clean stormwater into the environment and/or proposed reuse options on-site</li> <li>erosion and sediment control along drainage lines and discharge points, including stormwater flow control, vegetation, detention ponds, minimising land disturbance, and other temporary and permanent erosion protection measures.</li> </ul> Note 29: Guidance on stormwater management can be found in DWER's <a href="#">Stormwater Management Manual for Western Australia</a> .	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Attachments:</b>	N/A	Yes
2.19 <b>Attachment 11: Drawings and figures – surface water management infrastructure</b> Design drawings and layout figure(s) of the proposed surface water management infrastructure.	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Part 2G: Monitoring requirements		
<b>NOTE:</b> <ul style="list-style-type: none"> <li>A comprehensive monitoring program should be developed to support the ongoing operation of a landfill facility. Aspects that should be included in the program (as a minimum) include leachate, landfill gas, surface water and groundwater. Odour monitoring should also be considered, depending on the environmental siting.</li> <li>The operator must continually review the positioning of monitoring points during the regular review of monitoring data, and as the landfill facility expands consideration must be given to expanding the monitoring network to reflect the design proposals (and refinement of the CSM).</li> <li>Typical monitoring aspects are outlined further below. Where an operator elects not to commit to certain monitoring programs, they must provide clear justification and rationale for this decision.</li> </ul>		
	Yes	N/A
2.20 <b>Leachate quality monitoring</b> Provide details of the proposed leachate quality monitoring program (refer also to Part 2D), including, but not limited to, sampling locations, sampling methodology, analysis suite, sampling frequency, and reporting requirements.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2.21 <b>Landfill gas monitoring</b> Provide details on the proposed landfill gas monitoring program (refer also to Part 2E), including, but not limited to, sampling locations, well/monitoring point construction specifications, sampling methodology, analysis suite, sampling frequency and reporting requirements.  Proposed sampling locations should give regard to the landfill surface, subsurface (in-waste), perimeter, subsurface services on and adjacent to the site, buildings or structures on and adjacent to the site, and landfill gas treatment/management infrastructure (such as flares and combustion engines).  Action levels for different monitoring locations must be documented to outline what action will be taken to address the matter and/or what further monitoring will be carried out to verify the effectiveness of corrective actions.	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Part 2G: Monitoring requirements			
2.22	<p><b>Groundwater and surface water monitoring</b></p> <p>Provide details on the proposed groundwater and surface water monitoring program, including, but not limited to:</p> <ul style="list-style-type: none"> <li>• sampling locations</li> <li>• well construction specifications</li> <li>• sampling methodology</li> <li>• analysis suite</li> <li>• sampling frequency</li> <li>• reporting requirements.</li> </ul> <p>The monitoring program should as a minimum seek to establish:</p> <ul style="list-style-type: none"> <li>• the background groundwater quality and levels (in mAHD and mBGL)</li> <li>• the background surface water quality and levels/flow rates and flow direction</li> <li>• the local aquifers, and groundwater flow direction and rates of each aquifer</li> <li>• a monitoring network that acts as an early indicator of leachate contamination in groundwater or surface water prior to offsite migration.</li> </ul> <p>For a new facility, the operator should seek to demonstrate baseline groundwater and/or surface water conditions prior to construction works and to feed the results of this monitoring into the initial CSM development.</p> <p>A sampling and analysis quality plan (SAQP) should be prepared to ensure that the data collected is representative and sufficient to address critical gaps and uncertainties identified in the CSM so that the information obtained provides a reliable basis for continually reviewing site operations and meeting compliance requirements of the operating licence.</p> <p>Further guidance on developing a groundwater and surface monitoring program, including the development of a SAQP, can be sourced from DWER's <a href="#">Assessment and management of contaminated sites guideline</a> and from Schedule B2 of the <a href="#">National Environment Protection (Assessment of Site Contamination) Measure 1999</a> (NEPM).</p>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Attachments:</b>		<b>N/A</b>	<b>Yes</b>
2.23	<p><b>Attachment 12: Landfill monitoring plan</b></p> <p>Applicants must document the proposed monitoring program in a landfill monitoring plan or a series of equivalent standalone monitoring and/or management plans.</p> <p>The SAQP required in Part 2.22 should be incorporated in this plan.</p>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Part 3: Premises operations			
<p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>• In addition to the landfill design and construction, operational practices play an integral role in the protection of the environment.</li> <li>• This section outlines the operational management aspects that must be addressed as part of an application. Focus should be given to the day-to-day activities which are undertaken at the facility and the practices to be implemented to minimise amenity and environmental impacts.</li> </ul>			
		<b>N/A</b>	<b>Yes</b>
3.1	<p><b>Landfill management and operations</b></p> <p>Provide operational detail on the following operational aspects:</p> <ul style="list-style-type: none"> <li>• operational hours of the facility</li> <li>• security fencing and site access</li> <li>• internal traffic control</li> <li>• details on weighbridge for monitoring waste acceptance</li> <li>• waste acceptance,<sup>30</sup> including details of acceptance and handling requirements for different waste types (e.g. putrescibles, asbestos waste, special waste types, contaminated solid wastes, etc.) and record keeping</li> <li>• landfilling method/waste placement, filling sequence and tipping face management (the vertical and horizontal size of the tipping face must be specified).</li> </ul>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Part 3: Premises operations			
	<ul style="list-style-type: none"> <li>waste cover<sup>31</sup> (details on daily, intermediate and final cover, materials to be used, volumes required and storage area pre-use), litter and debris control (measures to prevent the discharge of litter and debris beyond the active landfill area and greater premises boundary)</li> <li>dust management – measures to prevent operations impacting environmental values and social surroundings</li> <li>odour management – measures to protect environmental values and social surroundings from unreasonable emissions of odour</li> <li>noise management – demonstrate and maintain compliance with the assigned levels specified in the Environmental Protection (Noise) Regulations 1997 (Noise Regulations)</li> <li>fire prevention and management (measures to minimise the risk of fires occurring at the facility) and emergency response procedures for fire and other emergencies (e.g. spills, landfill gas emergencies, etc.)</li> <li>vector management (measures to prevent the attraction, refuge, growth and spread of vermin and pests to mitigate impacts to environmental values and social surroundings)</li> <li>chemical and fuel stores, including details of storage requirements</li> <li>environmental monitoring (refer to Part 2G)<sup>32</sup></li> <li>contingency planning (map out all likely incidents and document appropriate corrective measures).</li> </ul> <p>Note 30: Information must be consistent with the requirements outlined in Part 8 (Emissions, discharges, and waste) of the main application form i.e. wastes must be described in accordance with the <a href="#">Landfill Waste Classifications and Waste Definitions 1996</a>.</p> <p>Note 31: Alternative daily and interim cover materials can be proposed but must be supported by details of the physical and chemical properties of the alternative cover together with information on how it will achieve the same or better performance outcomes, taking into consideration seasonal variation.</p> <p>Note 32: Reference can be made to the information provided against Part 2G of this checklist.</p>		
<b>Attachments:</b>		<b>N/A</b>	<b>Yes</b>
3.2	<p><b>Attachment 13: Landfill environmental management plan</b></p> <p>Applicants must document the operational management aspects in a consolidated landfill environmental management plan (LEMP).<sup>33</sup> The landfill monitoring plan (required by part 2G) can form part of the LEMP.</p> <p>Note 33: The LEMP is a dynamic document and must be reviewed on a regular basis as management and operational practices change at the facility. The LEMP should be made available to all operational staff and used in training.</p>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Part 4: Landfill closure and rehabilitation			
<p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li><b>Landfill closure, rehabilitation and aftercare management must be planned and considered in the initial design concept for the landfill facility.</b></li> </ul>			
		<b>N/A</b>	<b>Yes</b>
4.1	<p><b>Closure and aftercare management</b></p> <p>Provide information about the proposed closure and aftercare management of the facility, including, but not limited to:</p> <ul style="list-style-type: none"> <li>details of future intended land use</li> <li>details of progressive closure, capping and rehabilitation of used cells on the premises</li> <li>final landform and surface contours (pre- and post-settlement) for each landfill cell(s) which forms the scope of the application; a discussion on the final landform in the context of surrounding topography must also be provided</li> <li>landfill cap design detail and drawings (specifications and materials to be used in the final cap) – where geomembranes are proposed to be used in a capping system, similar design detail to that provided in Part 2B (landfill liner specifications) must be submitted (see Section 4.2 – Attachment 14)</li> <li>design detail for connections in the cap to landfill gas and/or leachate collection and monitoring points (where relevant)</li> </ul>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Part 4: Landfill closure and rehabilitation		
<ul style="list-style-type: none"> <li>stormwater management measures for water shed from the cap and final landform</li> <li>construction quality assurance (CQA) measures to be employed in cap construction/installation</li> <li>details on post-closure monitoring and aftercare management<sup>34</sup> (details of proposed environmental monitoring must be consistent with the information requirements outlined in Part 2G)</li> </ul> <p>Note 34: Post-closure monitoring and aftercare management must include inspections of the cap and surveillance of differential settlement to verify continually the integrity of the landfill cap.</p>		
<b>Attachments:</b>	<b>N/A</b>	<b>Yes</b>
<p>4.2 <b>Attachment 14: Landfill closure plan (including design figures)</b></p> <p>Applicants must document the proposed objectives and closure and rehabilitation measures (as required by Part 4.1) in a consolidated landfill closure plan (LCP).</p> <p>Within the plan the following drawings/figures must be provided:</p> <ul style="list-style-type: none"> <li>a) final contour map – depicting proposed final contours, top &amp; side slopes, and surface drainage features</li> <li>b) typical cross-sections of the proposed landfill cap and design (refer to Part 2A for liner design/construction information requirements – the same should be followed for the capping liner)</li> <li>c) location of passive gas and leachate management infrastructure intended to remain on the premises throughout closure.</li> </ul>	<input type="checkbox"/>	<input checked="" type="checkbox"/>