Government of Western Australia
Department of Water and Environmental Regulation

Decision Report

Application for Works Approval

Part V Division 3 of the *Environmental Protection Act 1986*

Works Approval Number	W6937/2024/1
Applicant	Shire of Plantagenet
ABN	29 084 782 574
File number	DER2016/000376
Premises	Mount Barker Waste Management Facility O'Neill Road, MOUNT BARKER WA 6324 Legal description Part Lot 7546 on Deposited Plan 186612 Part Lot 350 on Deposited Plan 417644 As defined by the premises maps attached to the issued works approval
Date of report	30 January 2025
Decision	Works approval granted

Abbie Crawford

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Abbie Crawford
MANAGER, WASTE INDUSTRIES
an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

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1. Decision summary

This decision report documents the assessment of potential risks to the environment and public health from emissions and discharges during the construction and operation of the premises. As a result of this assessment, works approval W6937/2024/1 has been granted.

2. Scope of assessment

2.1 Regulatory framework

In completing the assessment documented in this decision report, the Department of Water and Environmental Regulation (the department; DWER) has considered and given due regard to its regulatory framework and relevant policy documents which are available at https://dwer.wa.gov.au/regulatory-documents.

2.2 Application summary and overview of premises

On 12 April 2024, the Shire of Plantagenet (the applicant) submitted an application for a works approval to the department under section 54 of the *Environmental Protection Act 1986* (EP Act).

The application is to undertake construction works relating to the expansion the Mount Barker Waste Management Facility (WMF), located at Lot 7546 on Plan 186612 (Crown Reserve 23969) and Lot 350 on Deposited Plan 417644, O'Neill Road, Mount Barker. The Shire of Plantagenet is proposing to expand the Mount Barker Waste Management Facility to include additional landfill cells to the west of the current public transfer station and existing landfill footprint, and south of the current liquid waste facility. The primary intent of the landfill expansion is to maximise the operational life of the landfill at the WMF (additional airspace for approximately 29 years of landfilling). The proposed expansion works are being supported through the staged capping of the completed landfill areas and the construction of leachate and stormwater management infrastructure. The application also proposes to realign the prescribed premises boundary.

The premises relates to the category and assessed production / design capacity under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations) which are defined in works approval W6937/2024/1. The infrastructure and equipment relating to the premises category and any associated activities which the department has considered in line with *Guideline: Risk Assessments* (DWER 2020) are outlined in works approval W6937/2024/1.

2.3 Exclusions

Time limited operations have not been granted for the operation of high-risk engineered critical containment infrastructure (landfill Cells 1 and 2 and the Leachate Evaporation Pond) in accordance with the department's regulatory framework. Operation of the engineered critical contaminant infrastructure will be halted until a licence amendment assessment is complete and a decision to grant or refuse is made.

Operational risks from critical containment infrastructure have been considered, but not risk assessed in full as part of this works approval. Operational risks will be assessed in full as part of the licence amendment assessment.

To avoid regulatory duplication, general site management requirements have not been included as part of the works approval. General site management requirements are regulated under the licence (L7026/1997/14).

2.4 Legislative context

2.4.1 Part V of the EP Act

The premises is currently licenced as a prescribed premises under the *Environmental Protection Act 1986* (EP Act). The licence (L7026/1997/14) relates to the prescribed premises categories as described in Table 1 below:

Table 1: Prescribed premises categories

Prescribed premises category description (Schedule 1, Environmental Protection Regulations 1987)	Production / design capacity
Category 61: Liquid waste facility - premises on which liquid waste produced on other premises (other than sewage waste) is stored, reprocessed, treated or irrigated.	1,000 tonnes per annual period
Category 64: Class II or III putrescible landfill site - premises on which waste (as determined by reference to the waste type set out in the document entitled "Landfill Waste Classification and Waste Definitions 1996" published by the Chief Executive Officer and as amended from time to time) is accepted for burial.	10,000 tonnes per annual period

2.4.2 Environmental Protection (Clearing of Native Vegetation) Regulations 2004

The applicant applied for a clearing permit (CPS 9906/1) under Part V Division 2 of the EP Act on 4 October 2022. The clearing permit application relates to the clearing of 0.69 hectares of native vegetation within Lot 7546 on Plan 186612 for the purpose of expanding the waste management facility. CPS 9906/1 is currently under assessment and no clearing is to commence until the clearing permit is issued.

2.4.3 Planning approvals

The expansion of the Mount Barker Waste Management Facility is considered a public work and is subject to a Public Work Exemption under the *Planning and Development Act 2005* (PD Act). The PD Act gives exempt bodies the power to undertake a public work or take land for the purposes of a public work without obtaining development approval from the responsible authority under the relevant planning scheme subject to certain conditions.

3. Location and siting

3.1 Siting context

The Mount Barker Waste Management Facility is located approximately 5 kilometres southeast of the Mount Barker town site. The Premises occupies a total area of 76 hectares and is immediately surrounded by native remnant vegetation to the north and east, with tree plantations to the southwest and cleared rural properties to the west and southeast.

3.2 Environmental siting

3.2.1 Climate and rainfall

Mount Barker is defined as having a Mediterranean climate characterised by warm dry summers and cool wet winters (BoM 2022). The closest Bureau of Meteorology (BoM) weather recording station to the Premises is the Mount Barker Weather Station (Station ID 9581), located approximately 4 km to the northwest.

Mount Barker's long-term median rainfall is 727 mm (BoM 2020). The majority of rainfall is received between June and August. The average maximum temperatures (1907-2022) range from 14.4 degrees Celsius (°C) in July to 26.3 °C in January. The average minimum temperatures range from 6.1 °C in July to 13.1 °C in February (BoM 2022). A summary of the rainfall and temperature data collected since 1907 is shown in Figure 1 below.

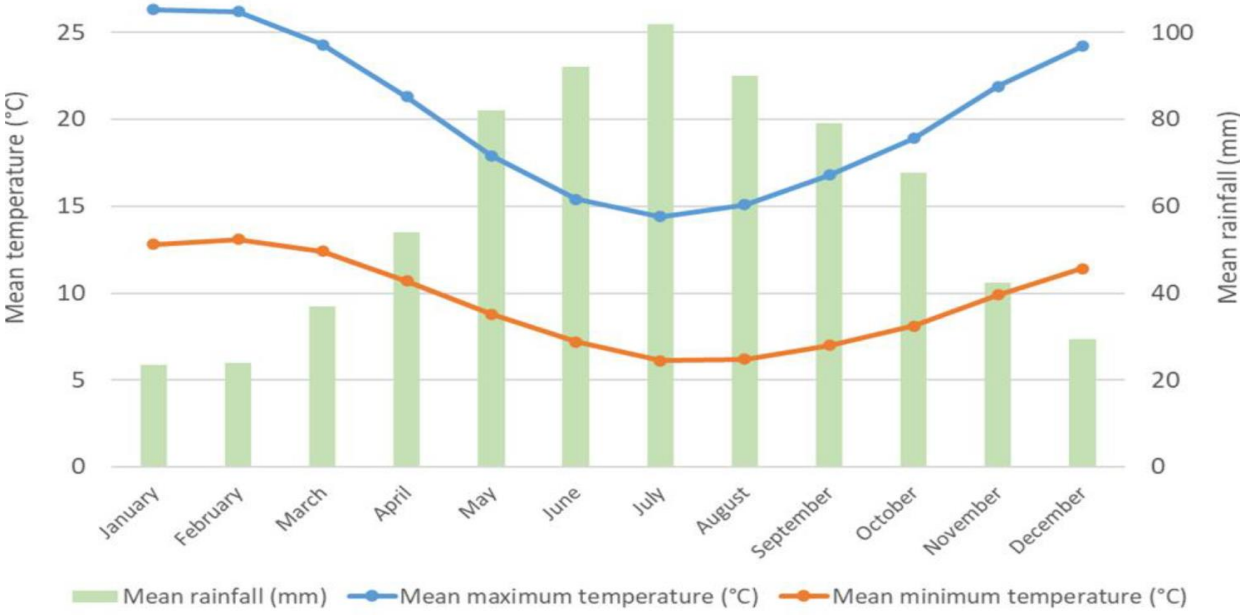
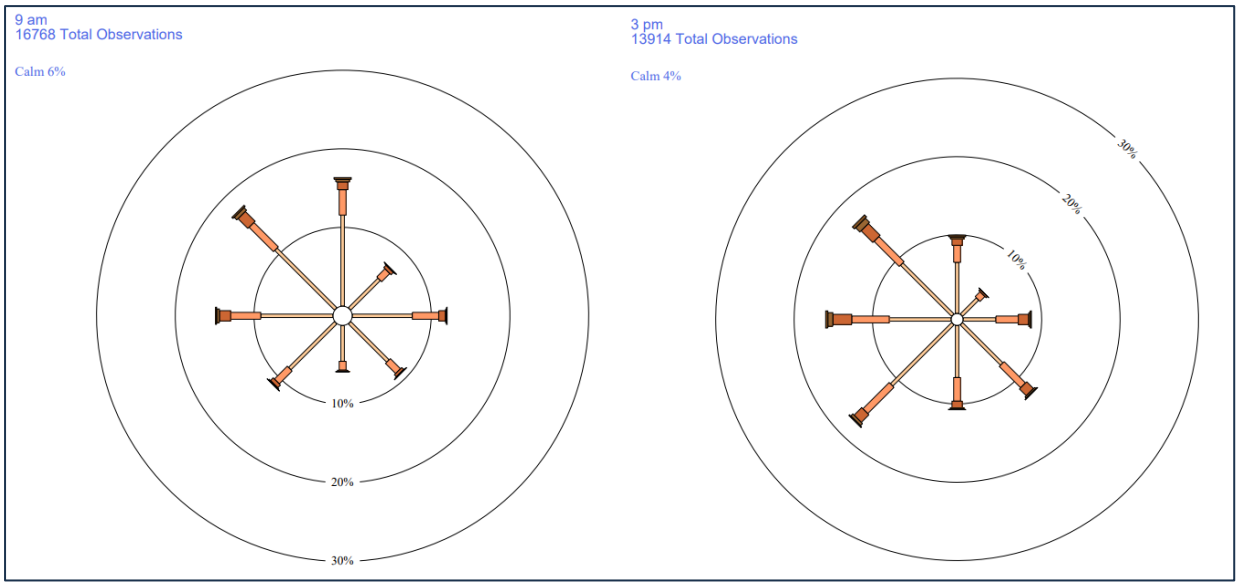


Figure 1: Rainfall and maximum temperatures

3.2.2 Wind direction and strength

The average morning (9 am) wind speed reported during summer is 9.3 kilometres per hour (km/hr), prevailing predominately from the east (BoM 2022). The wind speed marginally increases in the afternoon (3 pm), with an average wind speed of 11.5 km/hr, which prevails from a south-east to south-westerly direction (BoM 2022). During winter months, winds abate to an average of 9.0 km/hr during the morning and prevails from the north and northwest (BoM 2020). Annual 9am and 3pm wind roses are shown in Figure 2.



Source: BoM (Station No. 9581)

Figure 2: Wind direction and strength at Mount Barker at 9am (left) and 3pm (right)

3.2.3 Topography

The topography of the Premises and surrounding area gently slopes from 187 metres Australia Height Datum (mAHD) in the northeast towards 175 mAHD in the south. The landfill contours range from 188 mAHD in the central-western portion of the landfill to the lowest elevation of 176 mAHD at the toe of the south-south-western landfill batters (GHD 2021).

3.2.4 Regional geology

The surface geology at the Premises consists of a thin layer of quaternary coastal sandy deposits over Pallinup siltstone, and Weillup Formation clay, sandstone and limestone of the late Eocene Plantagenet group (Smith 1997). Archean granitoil bedrock of the Yilgarn Craton underlies this formation.

3.2.5 Local geology

The Premises is located within an area mapped as having a Level 2 acid sulphate soil (ASS) risk (DWER ASS Risk Mapping - accessed in March 2022) indicating a moderate-low risk of ASS occurring within 3m of the natural soil surface but high – moderate risk of ASS occurring beyond 3m of natural soil surface. A targeted soil investigation was undertaken by GHD as part of the preparation of the Closure and Post Closure Management Plan (GHD 2023e). Ten push tubes were advanced to the west and south of the existing landfill footprint to a maximum depth of 3 m below ground level (mbgl). The push tubes returned geology consisting of sand over a clay unit with variable amounts of sand fraction at each location (GHD 2020).

A previous soil investigation has also been undertaken in the western portion of the Premises, adjacent to the transfer station and landfill area, where the Shire intends on constructing the new landfill cells (Lynch 2016). Eight test pits were excavated to depths ranging between 2.4 and 2.8 mbgl. The test pits revealed a layer of coarse sandy material followed by sandy clay loams, clay loams and occasional light to medium clays with a significant portion of gritty angular sands. It was suggested that the sands are formed on either weathered metasediments or deposited from surrounding higher topography (Lynch 2016).

As part of the previous soil investigation, clay material from three of the test pits was sampled and analysed for various chemical and physical properties. The hydraulic conductivity results ranged from 4.7 x 10-9 m/s to 1.9 x 10- 10 m/s. Results for Cation Exchange Capacity were generally low across all three clay samples and were dominated by sodium. Therefore, it is likely that the clays are dispersive (Lynch 2016).

3.2.6 Groundwater

Six groundwater monitoring wells are currently installed on the Premises. Groundwater monitoring has historically been undertaken at groundwater monitoring wells MW1, MW2 and MW3. Historical standing water levels at these three monitoring wells indicate that local groundwater on the Premises flows in a southerly direction (Great South Bio Logic 2019). Groundwater elevations measured at these monitoring wells generally range between 177 mAHD and 180 mAHD up gradient from the landfill at MW1, and between 174 mAHD and 177 mAHD down gradient of the landfill at MW3.

Results from annual groundwater monitoring report (Great Southern Bio Logic 2019) indicate that groundwater levels down gradient of the landfill at MW3 range between 0 mbgl and 1 mbgl, with groundwater rising to the surface in months with high rainfall.

Groundwater monitoring wells, MW4, MW5 and MW6, were installed down gradient of the landfill footprint in 2020 as part of the most recent site investigations (GHD 2020), which intercepted groundwater between 6 mbgl and 7.5 mbgl during drilling. It is understood that the aquifer intercepted is confined and under pressure as settled water levels post-well construction rose to 0.3 – 2.4 mbgl (considered to be the potentiometric water level).

Preliminary hydraulic conductivity tests were undertaken at two bores (MW4 and MW6), and returned hydraulic conductivity values of 0.25 m/day and 0.4 m/day, respectively.

A cross section developed from the site investigations suggests that due to the nature of the low-permeability clay substrate, the landfill mass is positioned in the unsaturated zone. Given the pressure of the underlying aquifer, there may be potential for groundwater to penetrate this unsaturated zone of the soil and rise within close proximity of the ground surface and landfill base.

A review of existing groundwater quality data indicates that the current landfill is not impacting the down gradient groundwater quality (GHD 2020).

3.2.7 Surface water

Surface water enters the Premises from the northeast corner of the prescribed premises boundary through a seasonal creek. A large surface water diversion drain carries water from the northern boundary of the site to the west of the landfill, where it enters a sediment pond. Surface water at the site then drains in a southerly direction to the Sleeman Creek located in the southern half of the Premises, eventually discharging to Blue Gum Creek approximately 23 km south of the site. Informal channels run north to south down the eastern and western sides of the Premises to divert surface water in a southerly direction.

An on-site sediment pond is currently located in the southwest corner of the landfill which collects surface water runoff from the landfill. However, this pond does not function properly due to a lack of formal drains to direct runoff towards this pond.

Surface water monitoring locations, SW1 to SW3, require biannual monitoring in line with the Premises licence; the required surface water analysis requirements are detailed in Table 2.3.1 of the licence. Surface water monitoring is undertaken at three on-site sampling locations: at the site entrance (SW1), within the downstream sediment pond (SW2) and within Sleeman Creek to the south of the landfill (SW3).

Elevated nutrients (comprising ammonia and total nitrogen) and metals (chromium, nickel and lead) concentrations have been reported at on-site sediment pond SW2, which collects surface water runoff from the landfill. It is noted that all nutrient and metal results reported during the 2018 and 2019 monitoring events were below the freshwater guidelines with the exception of total nitrogen results in 2018. Given the lack of leachate management infrastructure at the WMF, there is potential for leachate to seep from the landfill footprint and enter this sediment pond.

Surface water within this sediment pond is contained and does not appear to be impacting surface water downstream at SW3, as the elevated nutrient and metal concentrations are not reflected at this location. However, there is potential for the pond to overflow and result in downstream surface water contamination.

4. Social and cultural values

4.1 Aboriginal heritage

A desktop search of heritage places on the Aboriginal Heritage Inquiry System (AHIS) database indicated that there are no registered aboriginal sites or other places of heritage importance within the Premises boundary.

4.2 European heritage

A desktop search of heritage places on the Heritage Council inherit database indicated that there are no cultural places listed in the State Register of Heritage Places, local government inventories and other lists, the Australian Government's heritage list and other non-government lists and surveys within the Premises boundary.

5. Landfill engineering and design

5.1 Landfill design

It is understood that the existing landfill footprint was not lined prior to the commencement of landfilling, and waste was disposed directly onto the natural ground level, with no cell excavation occurring.

As part of the construction of future landfill cells, as well as areas where future filling is proposed on existing unlined landfill, a landfill liner is to be constructed to effectively contain and manage leachate from waste material within the proposed filling areas. A different liner profile is required for construction on previous unlined landfill (known as a piggyback liner) as consideration must be made for future settlement of the underlying waste material, compared to the cell liner which will be constructed directly onto natural ground.

5.2 Landfill liner design

The cell liner will be constructed and keyed into the natural ground at the base of the existing landfill, to allow leachate from the existing landfill to drain seamlessly into the new landfill cell and towards the proposed leachate collection system.

The typical cell liner profile to be used as part of the construction of future landfill cells is detailed in Figure 3 and Figure 4 below.

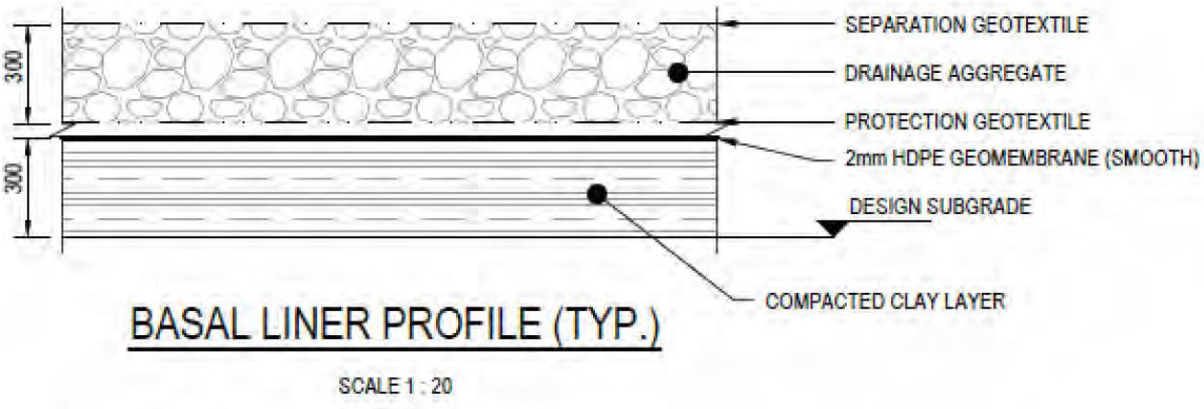


Figure 3: Typical basal liner profile

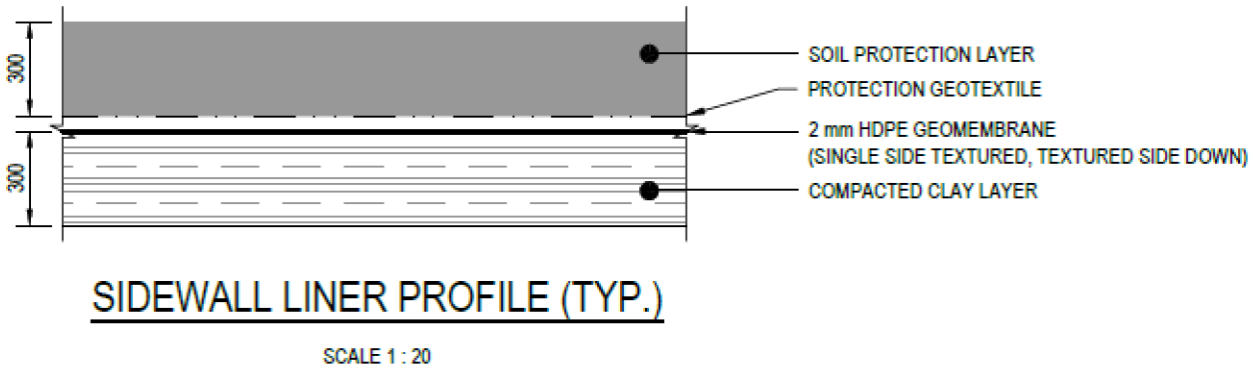


Figure 4: Typical sidewall liner profile

The low permeability compacted clay layer is proposed to be designed to achieve a hydraulic conductivity no greater than 1 x 10^{-9} m/s. Given the high clay content and associated low permeability results reported for the on-site clay material, ranging from 4.7 x 10^{-9} m/s to 1.9 x 10^{-10} m/s (Lynch 2016), it is proposed (with further verification of suitability) that a layer of compacted low-permeability clay be incorporated into the cell liner profile, as well as the piggyback liner profile.

5.3 Piggyback liner design

A piggyback liner comprises a similar profile to standard cell liners, however, it includes a landfill gas layer to effectively manage landfill gas generated from the underlying unlined landfill cell, and a settlement control layer to retain the integrity of the landfill liner as the underlying waste material settles over time. The piggyback liner profile to be used in the constructed of the Cell 1 batter slopes, prior to future landfilling, is detailed in Figure 5 below.

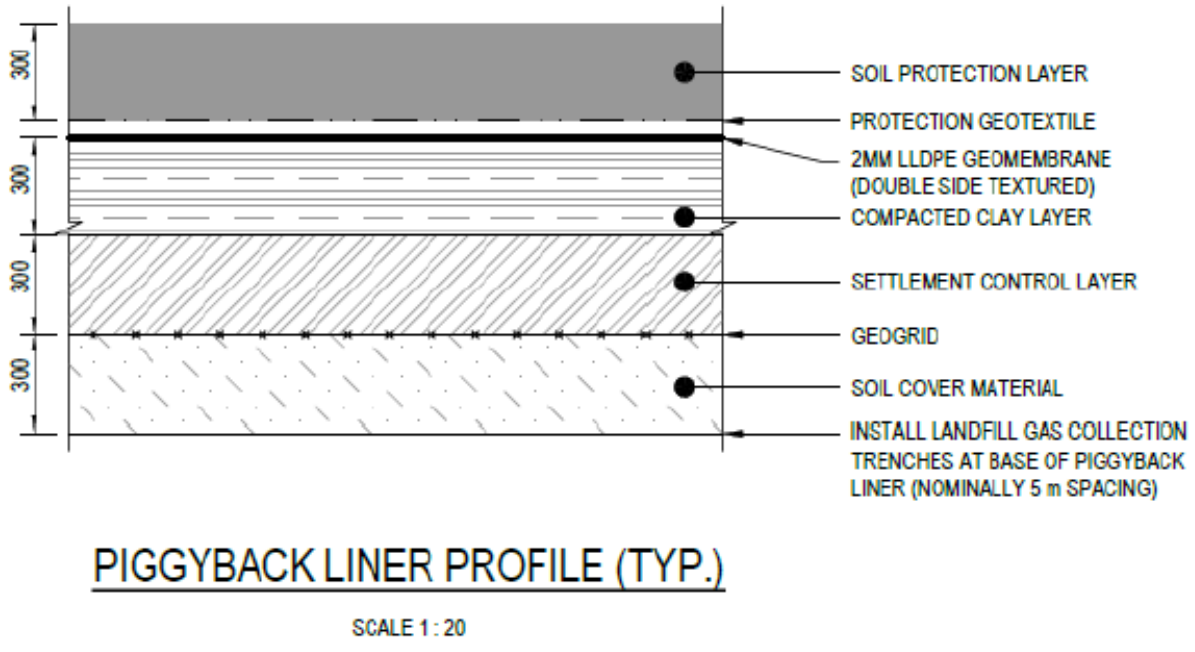


Figure 5: Typical piggyback liner profile

5.4 Construction quality assurance

Construction Quality Assurance (CQA) activities will be required to be undertaken during construction of the lined landfill cells. These activities will be undertaken by an independent, suitably qualified engineer that is not affiliated with contractors, suppliers or manufacturers. A CQA Plan has been prepared that outlines the CQA requirements including quality assurance procedures and testing methods for construction.

5.5 Landfill stability

The applicant engaged GHD to undertake a stability assessment of the landfill cell piggy back liner and capping systems. Liner interface stability calculations were completed in line with standard industry practice, using guidance provided in Geotechnical Aspects of Landfill Design and Construction (Qian et al 2002). A range of relevant scenarios were considered in line with this guidance including consideration of seepage, construction method and gas uplift where relevant.

The applicant has not assessed the following components of the overall design as outlined below:

- Basal liner: The base of the landfill cells is on a shallow grade (1-2%) that will not induce any significant stability concerns.
- Sidewall liner: The sidewall liner is only at the perimeter of the cells at a minimal height (to achieve perimeter containment) that will not induce any significant stability concerns.
- Final capping on plateau areas: The plateau of the final landform is on a shallow grade (~5%) that will not induce any significant stability concerns.

The applicant has proposed that any key material assumptions are fed into the detailed design documentation for the works during that phase (via interface friction testing requirements in the final technical specification). This will be captured by the comprehensive stability assessment proposed for this phase, which may include additional design scenarios (such as earthquake loading) as required.

The *Mount Barker Waste Management Facility – Closure and Post Closure Management Plan* (CPCMP) (GHD 2021) for the WMF includes detailed requirements for the operational filling practices to be adopted during the filling of the new landfill cells. The proposed filling methodology has been developed with key considerations to waste stability. Results from the stability assessment suggest the filling methodology will be suitably stable across the design batter grades. Leachate levels would also be actively managed as per the CPCMP to mitigate potential stability issues relating to increased leachate levels.

Based on the above and the proposed geometry of the new landfill cells and final landform, no additional waste stability calculations were deemed necessary, however the applicant has proposed that this is revisited as part of the detailed design phase and comprehensive assessment to be completed at that time.

Key findings:

The Delegated Officer considers the need for comprehensive stability assessment to be developed and submitted to the department prior to construction activities commencing. The proposed comprehensive stability assessment should include, but not be limited to all key material assumptions, additional design scenarios (such as earthquake loading) and final waste stability calculations as a required, including the piggyback liner. Regulatory controls will be considered for inclusion in the works approval to ensure that a comprehensive stability assessment is developed and provided to the department.

5.6 Stormwater management

As part of the landfill progression and as each landfill stage is progressively capped and stabilised, formal diversion, down batter and toe drains will be constructed into the final landform and around the perimeter of the landfill to effectively convey undisturbed runoff from the landfill to the south, where it is discharged off site, while minimising soil and cap erosion.

Additional stormwater drains will also be constructed along the east and west of the landfill footprint, diverting clean water from the upstream catchment around the landfill and towards the creek line to the south.

As the existing sediment pond, SW2, is located within the future landfill footprint and proposed leachate sump location, the applicant is proposing to decommission it prior to the construction of Cell 1. The construction and operation of a new sediment pond (SW4) will therefore take precedence of the proposed works to provide continuous stormwater management at the Premises, while the existing sediment pond is decommissioned. The existing sediment pond is typically dry as there are no formal stormwater drains diverting surface water runoff to this location. Therefore, it is expected that the pond will be dry during decommissioning works. The pond will be decommissioned by backfilling and compacting with material excavated from the new sediment pond.

The new sediment pond, SW4, will be constructed to the south of the landfill footprint. The sediment pond will be lined with a 300 mm compacted clay layer, utilising in situ excavation material and has been designed to contain a one in 20 (5 per cent) AEP, 24-hour rainfall event.

5.7 Leachate management

To manage leachate from future landfill areas, a leachate interception drainage layer is to be incorporated into the cell liner along the base of new landfill cells to capture leachate and direct it to a centralised leachate sump, which is to be located in the vicinity of the existing sediment pond, SW2.

Prior to the construction of the leachate sump and leachate interception drain associated with the new landfill cells, a leachate evaporation pond will be constructed to the west of the future landfill footprint. Similar to the liquid waste ponds at the front of the Premises, it is proposed that the leachate evaporation pond be lined with a high-density polyethylene (HDPE) liner underlain by a 300 mm compacted clay layer, utilising in situ excavation material, as illustrated in in Figure 6 below.

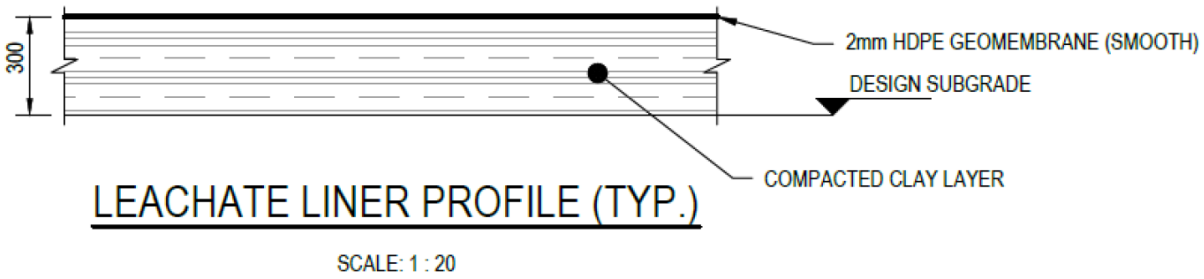


Figure 6: Typical leachate pond liner profile

A leachate balance and preliminary pond sizing was undertaken as part of the CPCMP (GHD 2023e) to size the leachate evaporation pond. Based on the findings of the leachate balance, the proposed leachate pond is proposed to have:

- A freeboard of 0.5 m;
- Internal slopes of 1V:2H;

- Total depth (including freeboard) of 3 m;
- Pond dimensions of 86 m x 81 m;
- Storage capacity of approximately 15,000 m^3 (excluding freeboard); and
- Minimum of two metres separation between groundwater and base of the pond.

The leachate water balance assessment identified the peak containment capacity required for the first two years of operation to be 10,844 m^3 with the overall peak storage capacity for all stages of the landfill to be 14,561 m^3. The leachate pond has therefore been designed to accommodate the overall peak capacity. As the peak volume is assumed to be later in the landfill lifecycle (i.e. stage 5), further leachate ponds can be installed should the actual leachate generation be greater than that modelled in the leachate water balance assessment.

5.8 Landfill gas management

There is currently no landfill gas (LFG) management system in operation at the Site.

To provide a greater understanding of landfill gas generation at the site, the landfill methane emission rates were estimated using the National Greenhouse and Energy Reporting (NGER) Solid Waste Calculator (2021-2022). The model estimates methane emissions per financial year ending (FYE) in tonnes of carbon dioxide equivalent (tCO2-e) in accordance with Method 1 of the NGER Guidelines.

The estimated LFG generation rates between FYE 1969 and FYE 2081 are shown in Figure 7 and summarised below. To allow for uncertainties and assumptions, a conservative approach has been applied, and all generation rates presented below represent the modelled worst case scenario:

- The site has been generating LFG since FYE 1971 and will continue to do so for many decades post FYE 2049 (the approximate end of its operating life, including the proposed landfill expansion).
- The site generation rate increased until it reached a peak of 85 m^3/hour at 50% v/v methane in FYE 2016, due to a peak in the annual waste tonnages accepted by the site in FYE 2015.
- The LFG generation rate decreased slowly from FYE 2017 and will plateau to 77 m^3/hour in FYE 2050, due to a decrease in the accepted waste tonnages.
- The LFG generation rate will steadily decrease from FYE 2050, as FYE 2049 is the last year the landfill is estimated to be operational.

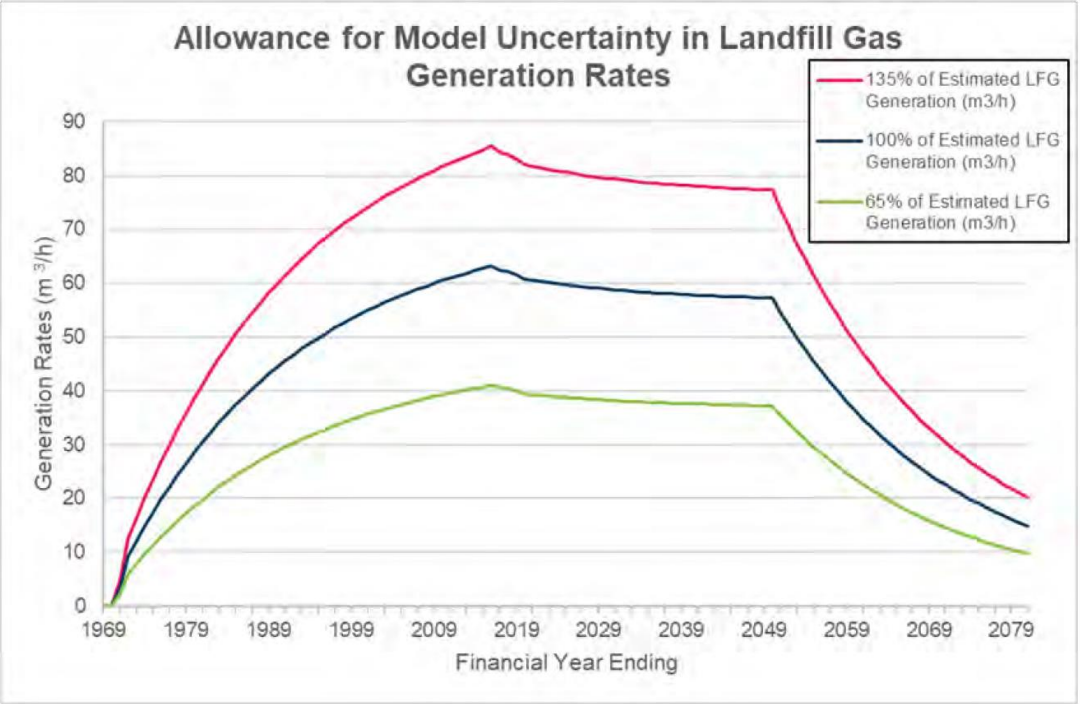


Figure 7: Estimated landfill gas generation rates

The model estimates a relatively low level of gas generation over the lifetime of the landfill, remaining below 90 m^3/hour. To determine appropriate landfill gas management measures, this estimated generation rate was considered alongside guidance within the EPA Victoria's Best Practice Environmental Management: Siting, Design, Operation and Rehabilitation of Landfills (2015).

The guidance suggests that only a low level of management will be required for the site – an oxidation and discharge technology such as passive flares, biofilters or biocover. This will be subject to further site-specific monitoring of gas generation within the landfill.

Based on the above, the following landfill gas management measures will be incorporated into the landfill operations:

- Design and implement a landfill gas collection and extraction system.
- Prior to the construction of a final cap, a landfill gas collection layer is to be constructed, comprising a 50 m x 50 m gravel trench grid system, that is connected to landfill gas vents to manage landfill gas generated within the landfill.
- A LFG monitoring program is to be developed and implemented during site operations and post closure to monitor the performance of this system, which is to include:
    - During site operations: surface emissions, and buildings and other on-site structures
    - Post closure: surface emissions, buildings and other on-site structures and landfill gas vents (as detailed below). Perimeter gas monitoring wells may be required should surface gas monitoring outside of the landfill footprint and/or gas accumulation monitoring within buildings and services indicate that migration is occurring.
- Additional site-specific gas generation investigations (i.e., landfill gas pumping trial) may be required contingent on the outcomes of the on-site monitoring program.

5.9 Cell closure

The applicant has provided a summary of the proposed capping of the landfill and proposes that the details and timing of cell closure is to be determined during the operational life of the facility based on a variety of aspects including waste inputs, landfill gas generation as well as determination of preferred revegetation and post closure use. The applicant has proposed that the final cap should be:

- Designed to limit water infiltration into the landfill and gas migration through the cap;
- Sufficiently graded to prevent water ponding on the cap and minimising infiltration through the cap;
- Landfill plateaus are to be graded to at least 5% to adequately shed water;
- External landfill batters steeper than 20% require specific stormwater infrastructure to control runoff and minimise cap erosion; and
- Designed to provide a landform suitable for its intended after use.

The final capping profile for the site should be based on the outcomes of site-specific risk assessment to ensure the cap is sufficient to manage risks to the environment and human health. The proposed typical capping profile for the premises is illustrated in Figure 8 and described below.

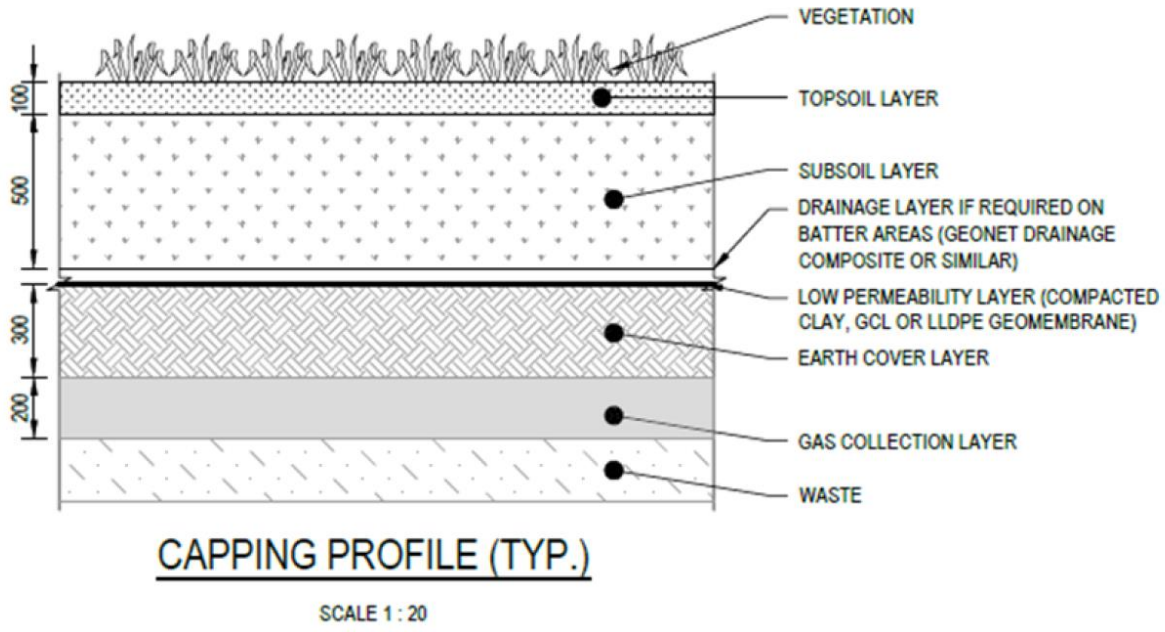


Figure 8: Typical capping profile

6. Operational overview

6.1 Operational overview

The following outlines the landfill operations with regards to placement, compaction and management of landfilled wastes for the current and future landfill cells.

6.2 Waste acceptance

Only waste permitted under the site licence shall be landfilled at the site.

6.3 Landfill management

The surface area of waste exposed during operations shall be minimised. The area of the active tipping face should be no greater than 400 m^2 with waste batters to be steeper than 1 (vertical) in 3 (horizontal).

Waste placement shall be undertaken such that pre-capping contours are suitable for placement of the final capping layer.

Every lift of waste must be evenly compacted with mechanical plant to the greatest extent practicable. The level of compaction that can be achieved is, among others, dependent on the machine used. It is estimated that a compaction of 0.65 tonne/m^3 will be achieved on site. To maximise compaction and machinery efficiency, the following has been considered:

- Where soil cover is used, temporary soil cover should be removed at the commencement of daily operations and pushed to the top and base of the tip face to create soil bunds which assist the diversion of stormwater around the tip face.
- Where feasible, a small bund should be constructed to delineate the working face ahead of filling. This bund can be constructed from reclaimed cover material placed on previous fill sections. This bund will help ensure the width of the working face is not extended beyond suitable dimensions.
- Waste should be placed as close to the tip face as possible to reduce machinery movements.
- Where possible, waste should be placed at the top of the tip face and pushed vertically down the tip face in lifts no more than 300 mm in thickness.
- A minimum of four passes in two directions should be completed on each lift of waste.
- Isolate or separate bulky loads at the tip face that have limited potential for compaction.
- Instrumentation can also be installed within the compactor to track waste compaction density and assist with guiding the operator on where to focus.
- More frequent airspace survey and modelling can also help track compaction efficiency.

Each cell will be progressively filled in rows that commence adjacent to the existing waste mass and move forward in a linear manner. This will help reduce the area of stormwater that should be contained as leachate and allow interim surfaces to be graded away from the operational area.

6.4 Stormwater management

An existing downstream sediment pond, SW2, is located to the south west of the landfill, which collects surface water runoff from the landfill. However, it is understood that there are currently no formal drains in place to direct the runoff towards this pond.

All surface water runoff from the upstream catchment and the site are directed in a southerly direction towards Sleeman Creek via several informal diversion drains.

During operation, stormwater captured from the landfill areas will be directed to the on-site sediment pond for management prior to off-site discharge. Sediment pond SW2 will be utilised until the new sediment pond, SW4, is constructed. SW4, will be constructed to the south of the landfill footprint with the sediment pond to be lined with a 300 mm compacted clay layer.

Preliminary pond sizing was undertaken as part of the CPCMP (GHD 2023e) to size the sediment pond, with design parameters, assumptions and dimensions detailed below:

Table 2: Sediment pond details

Parameter	Value
Catchment area	4.0 ha
24 hour storm event, ARI of 1 in 20 years	96.48 mm
Volumetric runoff coefficient	0.7
Upper settling volume	2,700 m^3
Sediment storage zone (half the size of settling volume)	1,350 m^3
Required sediment storage and settling volume	4,050 m^3
Estimated pond storage and settling zone dimensions (from base to spillway height)	
Pond dimensions	60 m x 50 m
Storage pond depth (from base to spillway height)	2.0 m
Internal slope	1V:3H
Available pond volume (including freeboard volume)	4,776 m^3

As the landfill is progressively capped, uncontaminated stormwater that has not come into contact with the historical or new landfilling areas shall be discharged directly offsite without prior management via the sediment ponds.

7. Risk assessment

The department assesses the risks of emissions from prescribed premises and identifies the potential source, pathway and impact to receptors in accordance with the *Guideline: Risk Assessments* (DWER 2020).

To establish a risk event there must be an emission, a receptor which may be exposed to that emission through an identified actual or likely pathway, and a potential adverse effect to the receptor from exposure to that emission.

7.1 Source-pathways and receptors

7.1.1 Emissions and controls

The key emissions and associated actual or likely pathway during premises construction which have been considered in this decision report are detailed in Table 3 below. Table 3 also details the control measures the applicant has proposed to assist in controlling these emissions, where necessary.

Table 3: Proposed applicant controls

Emission	Sources	Potential pathways	Proposed controls
Construction			
Dust	Vehicle movements on unsealed surfaces, earthworks, construction and installation of site infrastructure	Air / windborne pathway	A speed limit of 15 km/hr applies for all vehicles and moving plant within public areas of the landfill. A speed limit of 40 km/hr applies for service vehicles and moving plant within restricted areas of the landfill. Entrance and landfill access roads to be well maintained and watered if required. Speed limits to be enforced. Earthworks to be undertaken on days with little or no wind and/or when the soil to be excavated is moist, where practical. Use of a water truck as required. Development of a Construction Environmental Management Plan (CEMP)
Noise		Air / windborne pathway	Maintaining all landfill plant and machinery in proper working order. Ensuring all vehicles accessing the landfill use the designated access roads. Operating plant and equipment within specified working hours. Development of a Construction Environmental Management Plan (CEMP)
Odour	Exposure of buried waste during the construction works	Air / windborne pathway	Covering all exposed waste in a timely manner. Minimising disturbance of previously filled areas. Development of a Construction Environmental Management Plan (CEMP)
Asbestos fibres			Development of a Construction Environmental Management Plan (CEMP)
Contaminated	Earthworks,	Overland	Erosion and sediment controls are to be

Emission	Sources	Potential pathways	Proposed controls
and sediment laden stormwater	construction and installation of site infrastructure	runoff / migration onto surrounding land	considered and implemented during all construction works to minimise soil erosion and sediment movement. Development of a Construction Environmental Management Plan (CEMP)
Operation			
Dust	Vehicle movements on unsealed surfaces, earthworks, construction and installation of site infrastructure	Air / windborne pathway	A speed limit of 15 km/hr applies for all vehicles and moving plant within public areas of the landfill. A speed limit of 40 km/hr applies for service vehicles and moving plant within restricted areas of the landfill. Entrance and landfill access roads to be well maintained and watered if required. Speed limits to be enforced. Earthworks to be undertaken on days with little or no wind and/or when the soil to be excavated is moist, where practical. Use of a water truck as required. Covering all exposed waste prior to any rainfall event with daily cover material. Minimising disturbance of previously filled areas.
Noise	Waste acceptance and handling, disposal of waste, decomposition of wastes, tipping, application of landfill cover and vehicle movements	Air / windborne pathway	Maintaining all landfill plant and machinery in proper working order. Ensuring all vehicles accessing the landfill use the designated access roads. Operating plant and equipment within specified working hours.
Odour	Waste acceptance and handling, disposal of waste, decomposition of wastes, tipping, application of landfill cover and vehicle movements	Air / windborne pathway	Covering all exposed waste in a timely manner. Minimising disturbance of previously filled areas. Installation of a landfill gas management system. Daily compaction and covering of waste. Immediate burial or covering of odorous loads. Controlling the deposition of potentially malodorous wastes (immediate covering).
Windblown waste	Waste acceptance and handling, disposal of waste, decomposition of	Air / windborne pathway	Establishing and maintaining vegetative litter screens around strategic locations within the WMF, as required.

Emission	Sources	Potential pathways	Proposed controls
	wastes, tipping, application of landfill cover and vehicle movements		Upkeep and maintenance of permanent and strategically placed temporary litter screens (including removal of litter caught on the screens) around the perimeter of the landfill and around strategic locations within the WMF. Retrieval of litter from outside the perimeter of the WMF, when required. Covering all loads entering the WMF and during transit with the Facility Avoiding, if practicable, tipping and/or waste handling in exposed areas during windy conditions. Active waste tipping face work area to be maintained to a manageable area to mitigate windblown litter. Prompt, efficient placement, continuous compaction and covering of waste when unloading. Litter to be collected from surface water drainage infrastructure on a regular basis.
Pests / vermin / weeds	Waste acceptance and handling, disposal of waste, decomposition of wastes, tipping, application of landfill cover and vehicle movements	Biological pathway Air / windborne pathway	Compacting and covering waste, keeping exposed areas/volumes of waste to a minimum. Preventing unauthorised entry to the WMF. Undertaking regular inspections for pests, vermin and noxious weeds and development of a control plan, if required. Regularly conducting weed-spraying around the WMF. Care must be taken to ensure that pesticides do not enter stormwater or leachate or pose an airborne pollution hazard or nuisance. Use of traps and/or baits to deter and/or control vermin, as well as engaging professional pest and weed control subcontractors, if required. Establishing and maintaining fire breaks between the WMF boundary and surrounding areas. Adequately draining the WMF to prevent water ponding. Keeping leachate and stormwater ponds free of mosquito breeding larvae.
Fire / Smoke	Waste acceptance and handling, disposal of waste, decomposition of wastes, tipping,	Air / windborne pathway	Establishing and maintaining fire breaks between the Site boundary and surrounding areas. Screening of loads for potentially hot wastes or

Emission	Sources	Potential pathways	Proposed controls
	application of landfill cover and vehicle movements		wastes with a risk of spontaneous combustion. Restrictions to smoking on-site. Regular compaction and covering of landfilled waste. Maintaining sufficient soil stockpiles adjacent to active landfilling areas to enable fire suppression if early intervention is possible. Maintaining an on-site water supply, either reticulated or from dams or tanks, combined with a means of delivery (pump and hoses or a tanker truck), during active landfilling operations.
Leachate	Waste acceptance and handling, disposal of waste, decomposition of wastes, tipping, application of landfill cover and vehicle movements	Infiltration into groundwater	Construction of a leachate collection and extraction system including an aggregate drainage layer, HDPE perforated pipe network, leachate sump, extraction riser and pump and a leachate evaporation pond. Progressive landfill capping and restoration.
Landfill gas	Waste acceptance and handling, disposal of waste, decomposition of wastes, tipping, application of landfill cover and vehicle movements	Air / windborne pathway Lateral migration through soil Dissolution into groundwater	Installation of composite lining system. Progressive installation of landfill gas management system including passive extraction. Progressive capping of landfill cells. Ongoing regular monitoring of landfill gas management system.
Contaminated and sediment laden stormwater	Waste acceptance and handling, disposal of waste, decomposition of wastes, tipping, application of landfill cover and vehicle movements	Overland runoff / migration onto surrounding land	Surface water management system to divert clean stormwater away from landfill. All stormwater entering the landfill cells to be collected by the leachate management system.

7.1.2 Receptors

In accordance with the *Guideline: Risk Assessment* (DWER 2020), the Delegated Officer has excluded the applicant's employees, visitors, and contractors from its assessment. Protection of these parties often involves different exposure risks and prevention strategies, and is provided for under other state legislation.

Table 4 below provides a summary of potential human and environmental receptors that may be impacted as a result of activities upon or emission and discharges from the prescribed premises *(Guideline: Environmental Siting* (DWER 2020)).

Table 4: Sensitive human and environmental receptors and distance from prescribed activity

Human receptors	**Distance from prescribed activity**
Mount Barker township	5 km northwest of the premises
Closest residential receptors	1.7 km southeast of the premises 2.5 km northwest of the premises
Neighboring agricultural property	Dams 500 m and 1 km west of the site
Environmental receptors	**Distance from prescribed activity**
Threatened and Priority Fauna	*Isoodon fusciventer* have been sighted within 300m of the prescribed premises.
Threatened and Priority Flora	*Synaphea preissii* is located approximately 850m the to the east of the prescribed premises. *Caladenia harringtoniae* is located within the prescribed premises boundary, approximately 200m to the southeast of the active landfill area.
Underlying groundwater (non-potable purposes)	Groundwater levels vary from around 8-9 m below ground level (BGL) in the northern section of the site, to being at or just below the surface at the southern groundwater monitoring bore (MW3) - seasonal perched system
Sleeman creek	50 m south of the landfill.
Seasonal water lines and depressions	Within premises boundary
Remnant native vegetation	Directly adjacent to eastern premises boundary
Timber plantations – DBCA Managed Land	Directly adjacent to southern premises boundary, approximately 750m to the south of the active landfill areas

7.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020) for each identified emission source and takes into account potential source-pathway and receptor linkages as identified in Section 7.1. Where linkages are in-complete they have not been considered further in the risk assessment.

Where the applicant has proposed mitigation measures/controls (as detailed in Section 7.1), these have been considered when determining the final risk rating. Where the delegated officer considers the applicant's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the works approval as regulatory controls.

Additional regulatory controls may be imposed where the applicant's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 5.

Works approval W6937/2024/1 that accompanies this decision report authorises construction only. The conditions in the issued works approval, as outlined in Table 5 have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

A licence is required to authorise emissions associated with the ongoing operation of the premises i.e. new landfill cell operations. A risk assessment for the operational phase has been included in this decision report, however licence conditions will not be finalised until the department assesses the licence application.

Table 5: Risk assessment of potential emissions and discharges from the premises during construction

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
Construction								
Vehicle movements on unsealed surfaces, earthworks, reprofiling of the current landfill area, construction and installation of site infrastructure	Dust	Air / windborne pathway causing impacts to health and amenity	Residences located 1.5 and 2.5 km from the premises Threatened fauna (closest 300m from the premises)	Refer to Section 7.1.1	C = Minor L = Unlikely **Medium Risk**	Y	N/A	Emission to be regulated under the general provisions of the EP Act
	Asbestos fibres			Refer to Section 7.1.1	C = Severe L = Unlikely **High Risk**	N	**Condition 5, 6, 7**	The controls stated by the applicant are required to mitigate risks associated with fugitive dust (asbestos) emissions to sensitive receptors. The requirement for the development of a Construction Environmental Management Plan has been conditioned within the works approval. Additional controls relating to the discovery and management of unexpected asbestos finds has also been included within the works approval.
	Noise			Refer to Section 7.1.1	C = Minor L = Unlikely **Medium Risk**	Y	N/A	Emissions to be regulated under the *Environmental Protection (Noise) Regulations 1997* (EP Noise Regulations)
	Odour			Refer to Section 7.1.1	C = Moderate L = Unlikely **Medium Risk**	Y	N/A	Emission to be regulated under the general provisions of the EP Act
	Sediment laden stormwater	Overland runoff potentially causing ecosystem disturbance or impacting surface water quality	Threatened fauna (closest 300m from the premises) Threatened and Priority Flora (closest 200m from the active	Refer to Section 7.1.1	C = Minor L = Possible **Medium Risk**	Y	N/A	Emission to be regulated under the general provisions of the EP Act

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
			landfill area) Sleeman creek 50 m south of the landfill. Seasonal water lines and depressions within premises boundary Remnant native vegetation directly adjacent to premises Timber plantations directly adjacent to southern premises boundary					
Operation								
Waste acceptance and handling, disposal of waste, decomposition of wastes, tipping, application of landfill cover and vehicle movements Collection, storage and management of leachate Ongoing management of premises	Dust	Air/windborne pathway causing impacts to health and amenity	Residences located 1.5 and 2.5 km from the premises Threatened fauna (closest 300m from the premises)	Refer to Section 7.1.1	C = Minor L = Unlikely **Medium Risk**	Y	N/A	Emission to be regulated under the general provisions of the EP Act
	Noise			Refer to Section 7.1.1	C = Moderate L = Unlikely **Medium Risk**	Y	N/A	Emissions to be regulated under the *Environmental Protection (Noise) Regulations 1997* (EP Noise Regulations)
	Odour			Refer to Section 7.1.1	C = Moderate L = Unlikely **Medium Risk**	Y	N/A	Emission to be regulated under the general provisions of the EP Act
	Windblown waste	Air/windborne pathway causing impacts to amenity	Residences located 1.5 and 2.5 km from the premises Threatened fauna	Refer to Section 7.1.1	C = Minor L = Possible **Medium Risk**	Y	N/A	Supporting infrastructure has been excluded from the assessment (see Section 2.3). Further operational controls for windblown waste may be considered as part of the licence

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
			(closest 300m from the premises)					assessment.
	Pests / vermin	Biological pathway causing impacts to health and amenity	Biological pathway causing impacts to health and amenity Threatened fauna (closest 300m from the premises)	Refer to Section 7.1.1	C = Minor L = Possible **Medium Risk**	Y	N/A	Supporting infrastructure has been excluded from the assessment (see Section 2.3). Further operational controls for pests / vermin may be considered as part of the licence assessment.
	Weeds	Air/windborne or biological pathway causing impacts to amenity	Air/windborne or biological pathway causing impacts to amenity	Refer to Section 7.1.1	C = Major L = Unlikely **Medium Risk**	Y	N/A	Operational controls for weeds may be considered as part of the licence assessment.
	Landfill gas	Lateral migration through soil, movement through groundwater, or passive venting to air causing impacts to human health, amenity or explosion risk	Lateral migration through soil, movement through groundwater, or passive venting to air causing impacts to human health, amenity or explosion risk	Refer to Section 7.1.1	C = Severe L = Unlikely **High Risk**	Y	Conditions 4, 8 , 9, 10 **Condition 11, 12, 13, 41**	The Delegated Officer considers that the volume of landfill gas generated during the operation of cells 1, 2 and 3 will be negligible based on modelling results. The applicant proposes to install a landfill gas monitoring network around the perimeter of the landfill as a contingency measure. Construction and sampling of the landfill gas monitoring wells will be assessed and conditioned under the licence.
	Fire / smoke	Air/windborne pathway causing impacts to health and amenity	Residences located 1.5 and 2.5 km from the premises Threatened fauna (closest 300m from the premises) Threatened and Priority Flora (closest 200m from the active landfill area) Remnant native vegetation directly adjacent to premises	Refer to Section 7.1.1	C = Severe L = Unlikely **High Risk**	Y	N/A	The Delegated Officer considers that fires will be effectively managed by the proposed fire risk prevention and management controls. Supporting infrastructure relating to fire management has been excluded from the assessment (see Section 2.3). Further operational controls for fire may be considered as part of the licence assessment.

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
			Timber plantations directly adjacent to southern premises boundary					
	Leachate	Infiltration into groundwater causing contamination and impacting water quality	Neighboring agricultural properties Groundwater beneath the premises Sleeman creek 50 m south of the landfill. Seasonal water lines and depressions within premises boundary	Refer to Section 7.1.1	C = Major L = Unlikely **Medium Risk**	Y	Condition 1, 4, 8 **Condition 2, 3, 11, 12, 13, 14**	A leachate collection and extraction system has been incorporated into the design of the landfill. Leachate will drain through the waste mass to a leachate collection layer and directed to a sump, whereby leachate will be extracted via pump and transferred to the Leachate Evaporation Pond for storage and evaporation. Evaporation is the only proposed treatment method for leachate, however, recirculation of leachate back into the waste mass may be considered during consecutive wet years. The Delegated Officer has included the requirement for the works approval holder to submit a Comprehensive Stability Assessment prior to the construction of landfill cells. The Delegated Officer considers the risk to receptors from leachate impacts to be acceptable subject to the proposed landfill design and construction requirements in conjunction with the additional regulatory requirements under L7026/1997/14.
	Contaminated stormwater	Overland runoff / migration onto surrounding land causing ecosystem disturbance Seepage through soil to groundwater causing contamination and	Neighboring agricultural properties Groundwater beneath the premises Sleeman creek 50 m south of the landfill.	Refer to Section 7.1.1	C = Minor L = Possible **Medium Risk**	Y	Condition 1, 4, 17 **Condition 8, 9**	Construction and time limited operation requirements for stormwater management infrastructure have been included within the works approval as the existing sediment pond is proposed to be decommissioned prior to the construction of Cell 1. The construction and operation of a sediment pond will therefore provide

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
		impacting water quality	Seasonal water lines and depressions within premises boundary Remnant native vegetation directly adjacent to premises Timber plantations directly adjacent to southern premises boundary					continuous stormwater management at the Premises, while the existing sediment pond is decommissioned, and the new landfill cells constructed. Monitoring requirements for the sediment pond will be considered with any future licence amendment application.

Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the *Guideline: Risk Assessments* (DWER 2020).

Note 2: Proposed applicant controls are depicted by standard text. **Bold and underline text** depicts additional regulatory controls imposed by department.

8. Consultation

Table 6 provides a summary of the consultation undertaken by the department.

Table 6: Consultation

Consultation method	Comments received	Department response
Application advertised on the department's website on 26 June 24	None received	N/A
Applicant was provided with draft documents on 24 December 2024	Applicant responded on 22 January 2025 and requested the Works Approval be granted without change.	Noted

9. Conclusion

Based on the assessment in this decision report, the delegated officer has determined that a works approval will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

References

1. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
2. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Perth, Western Australia.
3. DWER 2020, *Guideline: Risk Assessments*, Perth, Western Australia.
4. GHD 2021. *Leachate Pond Sizing O'Neill Road Landfill Extension Shire of Plantagenet.* 7 May 2021.
5. GHD 2023, *Mount Barker Waste Management Facility Closure and Post Closure Management Plan.* 31 March 2023.
6. GHD 2023(a), *Mount Barker Waste Management Facility Stability Assessment Report.* 23 March 2023.
7. GHD 2023(b), *Mount Barker Waste Management Facility Preliminary Technical Specification.* 20 March 2023.
8. GHD 2023(c), *Mount Barker Waste Management Facility Preliminary Construction Quality Assurance Plan.* 17 March 2023.
9. GHD 2024, *Mount Barker Waste Management Facility, Works Approval Supporting Documentation.* 12 April 2024.
10. GHD 2023 (d), *Landfill Environmental Management Plan Mount Barker Waste Management Facility.* 09 June 2023