



Application for Licence

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

Licence Number	L8949/2016/2
Applicant	Bunbury Harvey Regional Council
File number	DER2016/000056
Premises	Stanley Road Waste Management Facility 51 Stanley Road WELLESLEY WA 6233 Legal description Lot 45 on Plan 17161 As defined by the coordinates in Schedule 4 of the licence
Date of report	27 June 2022
Decision	Licence granted

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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 of new, lined, landfill cells and operation of the premises.

The operation of the new, lined cells has not been re-assessed as part of the renewal application. Future operation of the lined cells is subject to demonstration of compliance with construction requirements and will be assessed as part of a future licence amendment following construction of the infrastructure. It is noted that risk associated with the operation of the lined cells was assessed as part of application for the construction of the lined cells. The assessment (L8949/2016/1 Decision Report, 19 December 2019) will be reviewed as part of the future licence amendment.

As a result of this assessment licence L8949/2016/2 has been partially renewed.

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) has considered and given due regard to its regulatory framework and relevant policy documents including the *Regulatory Best Practice Principles* and the *Compliance and Enforcement Policy* documents. These documents are available at <https://dwer.wa.gov.au/regulatory-documents>.

2.2 Application summary

On 2 March 2022, Bunbury Harvey Regional Council (BHRC; the Licence Holder) submitted an application for a licence renewal to the department under section 57 of the *Environmental Protection Act 1986* (EP Act).

The application sought to renew the licence to allow for continued operation of the site and to correct administrative errors made in the previous amendment i.e., the omission of household hazardous waste acceptance. No additional changes to the licence were sought.

The premises relates to the categories and assessed design capacity under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations) which are defined in licence L8949/2016/2 and Table 1 below. 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 licence L8949/2016/2.

Table 1: Prescribed premises categories

Prescribed premises category description (Schedule 1, <i>Environmental Protection Regulations 1987</i>)	Assessed design capacity
Category 13 - Crushing of building material: premises on which waste building or demolition material (for example, bricks, stones or concrete) is crushed or cleaned.	25,000 tonnes per annual period
Category 57 – Used tyre storage (general): premises (other than premises within category 56) on which used tyres are stored.	8,000 tyres per annual period
Category 62 – Solid waste depot: premises on which waste is stored, or sorted, pending final disposal or re-use.	35,000 tonnes per annual period

Prescribed premises category description (Schedule 1, <i>Environmental Protection Regulations 1987</i>)	Assessed design capacity
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.	100,000 tonnes per annual period

3. Overview of premises

3.1 Operations summary

The Stanley Road Waste Management Facility (WMF) (the premises) provides waste management services to the City of Bunbury, the Shire of Harvey and commercial waste operators. Activities at the site include crushing of construction and demolition waste, a community drop off facility/transfer station and a refund point for the container deposit scheme. The site also has a Class II putrescible landfill which is not currently operated.

3.2 Landfilling

The Stanley Road WMF includes a Class II putrescible landfill. Landfilling commenced in 1990. Putrescible waste has historically been disposed of at the Stanley Road Landfill into two (above ground) unlined landfill cells; one in the southern area of the premises (Cell A), and one in the northern area (Cell B). Waste has most recently been disposed of into unlined landfill Cell 1 which is located in the area between Cell A and Cell B. Section 4.1 below provides the full licensing history for the landfilling of waste within the unlined cells.

In December 2019 the department approved the construction two new contemporary landfill cells, Cells 2 and 3. Cells 2 and 3 are to be constructed with an engineered lining and leachate containment system. A comprehensive overview of the configuration of the liner system, leachate collection and storage system, stability and water balance assessments are contained in the 2019 decision report, which is attached as Appendix 4 to this report.

To date, construction of the lined cells has not been substantially commenced.

On 1 April 2022 Bunbury Harvey Regional Council notified the department that landfilling at the premises ceased on 25 March 2022. Landfilling ceased due to final landforms being achieved. The site continues to accept putrescible waste through the transfer station only.

3.3 Solid waste depot/transfer station

The Stanley Road WMF contains a drop-off facility/transfer station for local residents to bring self-hauled recyclables, items for the re-use shop, and drop-off of household hazardous waste and used oil, greenwaste and residual waste.

The transfer station also contains a Container Deposit Scheme (CDS) aggregation point where local residents bring eligible cans and bottles to collect their refund.

Figure 1 provides an overview of the layout of the transfer station.



Figure 1: Layout of the transfer station

3.4 Crushing of construction and demolition waste

The Licence Holder commissions a mobile inert waste crusher on a campaign basis, to process stockpiles of construction and demolition waste. The crushed material is then used onsite to level internal roads and/or removed offsite for use in construction and infrastructure works.

3.5 Used tyre storage

The premises is authorised to accept and temporarily store up to 8,000 tyres per annual period, with no more than 1,000 tyres to be stored at any given time. Tyres are to be stored in a dedicated area on an impermeable, bunded hardstand.

To date, the hardstand required for the storage of tyres has not been constructed.

3.6 Composting facility

On 24 April 2020 a Works Approval (W6223/2019/1) was issued for the construction of an enclosed tunnel composting facility and green waste mulching and storage area at the premises.

To date construction of the composting facility has not commenced.

4. Legislative Context

4.1 Licencing history - Part V, *Environmental Protection Act 1986*

The premises was first licensed under the EP Act in January 1997. Prior to this the landfill was regulated by the Department of Health. Municipal, industrial and commercial waste has been disposed of into three, above and below ground unlined landfill cells on the site since 1990.

Based on information provided in a 2011 groundwater monitoring report, the department's Contaminated Sites Branch confirmed, that a dissolved contaminant plume had developed in groundwater beneath the unlined landfill and surrounding areas.

On 28 November 2013 the licence was renewed for a 12-month period. In assessing the renewal, the department determined that closure of the unlined landfill area and placement of an engineered cap were considered essential to reduce the potential for further leachate generation and resulting impacts to groundwater. The reissued licence included requirements for the Licence Holder to submit plans for the closure of the site, as well as requiring groundwater investigations to determine the extent and severity of groundwater contamination associated with the unlined landfill.

The Licence Holder submitted a Landfill Closure Management Plan (LCMP) to the department in March 2014 that described the proposed staged progression of closure and rehabilitation of Cells A and B. The licence was amended in December 2014 to limit waste burial to within the final allowable void space in Cells A and B and to include improvement conditions requiring the Licence Holder to provide an updated LCMP and to provide a Construction Quality Assurance report once capping was complete to confirm capping works had been completed in accordance with licence conditions. The LCMP provided by the applicant in March 2014 stated that it was intended that once the void space in Cells A and B were reached, the Licence Holder would cease landfilling operations into unlined cells.

In March 2015 the Licence Holder applied to amend the licence stating that the slopes of Cells A and B were unstable, preventing the installation of a suitable engineered cap. To address the stability risk, the Licence Holder proposed re-profiling of the existing waste using additional waste and excavation of the existing waste landforms of Cells A and B. The department determined that a short-term (4-year) increase in waste disposal to achieve capping outcomes would not significantly worsen the existing groundwater contamination. In January 2016 the Licence Holder applied to amend the licence for the purpose of achieving stable batters for capping Cells A and B.

In July 2017 the Licence Holder submitted a licence amendment application proposing the construction of a third unlined cell (Cell 1), with a footprint area of 12,250m². The Licence Holder stated that Cell 1 was required to modify the footprint of the existing landfill to fill in a valley that existed between the northern (Cell B) and southern (Cell A) waste masses. By filling the valley between the two waste masses Cell 1 would be able to be used as a surface to 'piggyback' future engineered (lined) cells for the future proposed expansion of the Premises.

During the assessment of the application, the department identified potential unacceptable risks to sensitive receptors from further leaching of contaminants from the proposed volume of waste intending to be placed in unlined Cell 1. Through consultation between the Licence Holder and the department, a revised application was submitted in March 2018 to address the concerns that the department had relating to the environmental risk of leachate emissions. The revised application differed from the original application in terms of capacity and amount of putrescible waste proposed to be deposited into Cell 1. The revised application proposed a reduced footprint area of 6,800m² compared to the 12,250m² originally applied for.

The risk assessment undertaken by the department for the revised application (Amendment Notice 3 Decision Report granted on 1 May 2018) identified that the risk to a number of receptors was high and extreme. These risks were determined based on the known migration of leachate from the unlined cells into groundwater aquifers that connect to offsite groundwater abstraction bores with the potential to, or known to be, used for drinking water, non-potable uses, agricultural and industrial uses, as well as waterways (Wellesley and Brunswick Rivers) and conservation and multiple use wetlands. In considering the acceptability of the risk, the department had regard to the leachate generation rate associated with the duration of the development and the delayed capping of the entire unlined landfill waste mass (Cells A and B) that was assessed in the amendment granted in October 2016.

It was determined that the overall leachate volume generated from the Cell 1 extension would not be expected to be over and above that assessed and granted as part of the previous amendment. This determination was based on the tonnage of waste (30,000 tonnes) and the waste composition (relative proportion of putrescible waste to non-putrescible waste) that was

provided in the information that the Licence Holder submitted in support of the amendment applications associated with both the 2016 and 2018 amendment notices. The department also determined that the preferred option for managing ongoing groundwater contamination would be to limit leachate generation in the unlined cells by the capping and rehabilitation of a suitable final waste profile. It was considered that conditions on the instrument would be required to formalise the closure commitments made by the Licence Holder.

In May 2018, the department granted an amended licence allowing the development of unlined Cell 1 to a maximum footprint of 6 900 m² and with waste slopes to be no steeper than 1V:5H, along with conditions specifying timeframes for the cessation of landfilling in Cell 1 and capping of all the unlined cells. The amended licence also required that the Licence Holder prepare and submit an updated closure plan by 14 January 2019 that aligned with Cells A, B and 1, and that specified the timeframes for completion of waste disposal and capping that were intended to align with that specified in the licence.

The existing licence requires the Licence Holder to have ceased receiving waste into Cell 1 by 30 June 2021 to facilitate closure and capping of the unlined landfill (Cells A, B and 1) at the Stanley Road WMF. This condition was determined as part of the amended licence granted in May 2018. While the conditions of the existing licence allow the construction of two new lined landfill cells at the premises, the department has been advised by the licence holder that only preparation works have been undertaken and construction of the lined cells has not been substantially commenced.

4.2 Compliance - *Environmental Protection Act 1986*

4.2.1 Section 65 – Environmental Protection Notice EPN202102

On 5 July 2021, an Environmental Protection Notice (EPN) was given to Bunbury Harvey Regional Council to require it to control or abate emissions of leachate from the unlined landfill cells into groundwater.

The intention of the EPN was to enforce the closure and capping of the unlined cells at the Stanley Road WMF. The EPN allows only certain types of inert and low-risk waste to continue to be accepted into the unlined landfill to enable BHRC to continue to deliver essential municipal waste services to the local region.

On 3 September 2021 an inspection undertaken by the departments Compliance and Enforcement Branch identified that the Licence Holder was non-compliant with the requirements of the EPN.

On 1 April 2022 Bunbury Harvey Regional Council notified the department that landfilling at the premises ceased on 25 March 2022. Landfilling ceased due to final landforms being achieved.

4.2.2 Compliance against licence conditions

The department's published Guidance Statement: Risk Assessments (February 2017) states that operator history is a relevant consideration in establishing risk context and in determining risk likelihood criteria.

Operator history has been considered in the assessment of this renewal application. Information from compliance inspections and the content of Annual Audit Compliance Reports (AACR) and Annual Environmental Reports (AER) have been considered in the assessment of this application.

On 3 September 2021 an inspection undertaken by the department's Compliance and Enforcement Branch identified that the Licence Holder was non-compliant with 46 licence conditions and verification was required for a further 26 conditions. Non-compliances included:

- Storage of large volumes of woodwaste outside of a hardstand area;

- Storage of approximately 100 power poles outside of a hardstand area;
- Storage of in excess of 5,000 mattresses outside of a hardstand area;
- Storage of putrescible wastes for longer than 24 hours;
- Acceptance of waste types not authorised by the licence;
- Waste quantity limits exceeded;
- Stormwater infrastructure not constructed; and
- Timeframes specified in the licence not met, including
 - Timeframes for installation of landfill gas infrastructure;
 - Timeframes for closure and capping;
 - Timeframe for the cessation of landfilling into Cell1; and
 - Timeframe to provide an updated Closure and Post-Closure Management Plan.

Additional potential breaches of associated legislative obligations were identified at the 3 September inspection, namely the *Waste Avoidance Resource Recovery Levy Regulations 2004*, the *Environmental Protection Act 1986*, the *Environmental Protection Regulations 1987*, and the *Environmental Protection (Controlled Waste) Regulations 2004*.

Delegated officer summary:

- The Delegated Officer considers that the number and nature of non-compliances associated with the Premises brings into question Bunbury Harvey Regional Council's ability to implement controls effectively, through the management of operations at the site. Non-compliances related to waste acceptance and non-adherence to previously determined timeframes requiring capping and closure have been considered in the assessment of risks to the environment and public health.
- Operator compliance history in relation to implementation of proposed controls and licence controls has, also been factored into the department's assessment of risk (as included in Section 7 below) in line with Guidance Statement: Risk Assessment (February 2017).

4.3 Clearing - Part V, *Environmental Protection Act 1986*

Three clearing permits have previously been granted for the Premises (CPS 5394/5, CPS 7259/2 and CPS 8486/2).

CPS 5394/5 was for 6 hectares of native vegetation for the purpose of extracting material for daily cover of the landfill. The application area was determined to contain significant foraging habitat for the three black cockatoo species; Baudin's cockatoo (*Calyptorhynchus baudinii*), Forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*) and Carnaby's cockatoo (*Calyptorhynchus latirostris*). To mitigate the significant residual impacts identified, and an offset of 12.1 hectares was provided.

CPS 7259/2 was for 1.7 hectares of native vegetation for the purpose of expanding the landfill footprint to enable closure works to be undertaken. The application area was determined to contain significant foraging habitat for the three black cockatoo species. To mitigate the significant residual impacts identified, and in accordance with the WA Environmental Offset Policy and Environmental Offsets Guidelines, an offset of 6 hectares was provided.

CPS 8486/2 was for 8.41 hectares of native vegetation for the purpose of constructing lined Cells 2 and 3. The application area was determined to contain 7.8 hectares of native vegetation that was representative of the Commonwealth listed Banksia Woodlands of the Swan Coastal Plain threatened ecological community and provided significant foraging habitat for the three

black cockatoo species. To mitigate the significant residual impacts identified, and in accordance with the WA Environmental Offset Policy and Environmental Offsets Guidelines, an offset of 16.8 hectares was provided.

4.4 Contaminated Sites Act 2003

The lots occupied by the Stanley Road WMF were classified under the *Contaminated Sites Act 2003* (CS Act) as *contaminated – remediation required* on 15 September 2021.

The site was first classified as *possibly contaminated – investigation required* under the CS Act, based on information submitted to the department up to May 2007, since that time the site has been reclassified a number of times to reflect additional information submitted to the department up to August 2021.

The September 2021 classification requires that further groundwater, surface water, sediment and landfill gas investigations be carried out. The investigations are required to be reported in a Stage 2 Detailed Site Investigation (Stage 2 DSI). Contamination present beneath the Stanley Road WMF has been identified beyond the site boundary onto adjacent land to the west and south-west (refer to section 6.1). Parcels of land to the west of the landfill, including the neighboring sand mine and adjacent road reserves, are being regulated under the CS Act as 'affected sites'. Under the CS Act, the party responsible for remediation of a source site is also responsible for remediation of any affected sites. As the Stanley Road WMF is considered a 'source site', in accordance with regulation 31(1)(b) of the *Contaminated Sites Regulations 2006* the Stage 2 DSI is also required to be accompanied by a mandatory auditor's report (MAR).

A Stage 2 DSI was completed by the Licence Holder's consultant in April 2022, however, to date the department has not yet received a MAR. As the MAR is yet to be submitted, the results of the Stage 2 DSI have only been partially considered in this assessment, as the DSI has not yet been endorsed by the auditor.

4.5 Rights in Water and Irrigation Act 1914

The Premises is located in the Bunbury Groundwater Area which is a proclaimed area under the *Rights in Water and Irrigation Act 1914* and as such a licence is required to abstract groundwater.

Bunbury Harvey Regional Council holds a Licence to Take Water (GWL170993(2)) for an annual entitlement of 3,650 kL to be used for the purpose of dust suppression for earthworks and construction purposes.

Bunbury Harvey Regional Council also hold a Licence to Construct or Alter Well (CAW206106). This licence allows for the for the construction one non-artesian well.

4.6 Planning and Development Act 2005

The Shire of Harvey has advised that the licence renewal does not trigger a requirement for additional development approvals.

5. Exclusions and renewal scope considerations

This Decision Report supports the licence renewal determination and assesses the risk of emissions and discharges from the prescribed activities currently regulated by the existing licence to determine conditions for the renewed licence.

Section 4.2 identifies that the Licence Holder has been accepting solid wastes that are not currently authorised under the existing licence. Other unauthorised activities are also known to be occurring on the premises, including storage of solid waste outside of designated areas. These activities are not assessed as part of the renewal application. The Applicant is required to amend the licence in order for additional solid wastes to be accepted and stored at the

premises. A licence amendment application that includes these activities was submitted to the department on 31 May 2022.

Sections 3.2 and 4.2.1 identify that landfilling into Cell 1 ceased on 25 March 2022 due to final landforms being achieved. On this basis, the scope of the activities being assessed under the renewed licence excludes acceptance of waste for landfilling at the premises.

Further, EPN 202102 given on 5 July 2021 includes requirements for the development and implementation of a LCMP and includes requirements for the types of waste that can be accepted onto the premises. The scope of this renewal has considered duplication with requirements of the EPN in the determination of conditions under the renewed licence.

6. Monitoring and modelling data

6.1 Monitoring of groundwater

Groundwater investigations carried out under the CS Act have provided information on the hydrogeological properties of the groundwater pathway and the quality of groundwater impacted by the leachate from the unlined landfill. During the assessment of the 2018 amendment application, the department undertook an assessment of the hydrogeological information that was available at the time. The risk assessment considered that:

- The superficial aquifer has limited ability to attenuate leachate emissions due to the permeable nature of the aquifer geology.
- That there was complexity in groundwater flow directions caused by the presence of discontinuous clay layers, abstraction of groundwater on and surrounding the premises, and potential leakage into the confined aquifer.
- Groundwater flow pathways existed between the unlined landfill and beneficial users or groundwater and other receptors that have the potential to be impacted by degradation of groundwater quality.
- Despite the complexity in groundwater flow direction, it was considered that there was a potential pathway to connect the unlined landfill source to surface water features including waterways and wetlands located to the north, east and south of the premises.

6.1.1 Nature and extent of the groundwater plume

The Contaminated Sites classification identified the nature of contamination emanating from the premises is a leachate plume associated with putrescible landfill leachate present in groundwater under the northern and western portions of the site and extends off-site to the west. The plume was also suspected to extend off-site to the south-west and the classification notes that groundwater flow is complex.

Groundwater monitoring carried out in 2018 identified that contaminants including total dissolved solids, pH, nutrients (ammonia, total nitrogen, total phosphorus) and metals (aluminium, copper, iron, lead, nickel and zinc), were present in groundwater at concentrations exceeding freshwater aquatic ecosystems criteria. Hydrocarbons (such as from petrol or diesel), nutrients (ammonia nitrate), chloride, sodium, sulfate and metals (aluminium, iron, manganese and nickel) were present in groundwater at concentrations exceeding drinking water criteria. Concentrations of chloride, ammonia, aluminium, iron and hydrocarbons also exceeded criteria for non-potable groundwater use as published in the *Guideline: Assessment and Management of Contaminated Sites* (DER, 2014).

6.1.2 Residential groundwater bore survey

It is a requirement of the contaminated sites classification at the Stanley Road WMF, that BHRC complete further investigations that include establishing the nature and extent of groundwater impacts in the residential areas to the west and south-west of the Stanley Road WMF. In

October 2021, BHRC completed a doorknock-based groundwater bore survey of residential properties to the west of the premises to identify private groundwater bore locations and their use, and to offer to test the quality of groundwater sampled from the bores. A total of 196 houses were visited and 80 groundwater samples were collected. Each sample was tested for a large suite of analytes including metals, inorganics, and organics including per- and polyfluoroalkyl substances (PFAS).

Of the 80 residential groundwater bores sampled, PFAS compounds were detected in 14 bores. In one of the bores, the concentration of the sum of perfluorooctanesulfonic acid (PFOS) and perfluorohexanesulfonic acid (PFHxS) was greater than guidance values for drinking water, as published in the *PFAS National Environmental Management Plan* (Heads of EPAs Australia and New Zealand, 2020) (the PFAS NEMP). Further interpretation of the results, for all analytes, is expected to be provided in the Stage 2 DSI and MAR.

6.1.3 Groundwater and surface water quality

The geological and hydrogeological characteristics of the premises are outlined in Section 7.1.3 of this report, the following section summarises the monitoring of surface and groundwater quality at the premises.

The groundwater monitoring results presented in the 2021 Mandatory Auditors Report (MAR) (Kirsa, 2021) confirmed that nutrients and metals in the contaminant plume, originating from the unlined cells on the western portion of the premises exceed the relevant guideline values for non-potable uses (such as irrigation).

The 2021 MAR showed that the lateral extent of nutrient impacts extends further to the south in the intermediate bores, and to the east and north in deep bores, compared to nutrient impacts in shallow bores sampled in the same areas. This indicates that the high total dissolved solids content of the landfill leachate has caused the contaminant plume to 'sink' in the aquifer profile, adding further complexity to the nature of the fate and transport of contaminants within the groundwater plume.

As PFAS are highly mobile in groundwater, PFAS contaminants are likely to delineate the furthest lateral extent of the leachate plume. Data presented in the 2021 MAR found that the lateral extent of PFOS impacts in groundwater extended further to the west and southwest than the extent of nutrient impacts. PFOS was the dominant compound detected in shallow bores to the west of the landfill, however a much wider range of PFAS compounds were detected in the intermediate and deep bores close to the landfill, and in off-site bores to the south-west of the premises.

Sampling and PFAS analysis of irrigation bores at residential properties west of Forrest Highway in late 2021 provide further evidence that, based on the location of the bores sampled, the axis of the plume is aligned in a south-westerly direction.

Surface water and sediment sampling was carried out in the Brunswick and Wellesley Rivers in January 2022 as part of the sampling program for the Stage 2 DSI. Preliminary results provided informally to the department show that nutrient concentrations (total nitrogen and total phosphorous) in the river were present at concentrations exceeding the default guideline values for freshwater ecosystems at the 95% species protection level. However, the concentrations were consistent at both upstream and downstream sampling locations, and appear to be generally consistent with expected nutrient levels in the context of the intensive agricultural (beef and dairy) land use in the catchment. PFAS analysis found the PFOS and PFHxS concentrations in the river exceed the default guideline values for freshwater ecosystems at the 99% species protection level, but once again the upstream and downstream concentrations are nearly identical. The MAR which presents the formal interpretation of this data is yet to be provided to the department.

In addition to the sampling undertaken for the Stage 2 DSI, department personnel undertook opportunistic sampling and analysis for PFAS compounds in surface water upstream and

downstream of the premises in March 2022. Concentrations of PFOS and PFHxS in the river were indicative of typical background concentrations for a rural catchment.

The results presented above represent a point in time assessment on the groundwater and surface water quality at the relevant monitoring locations.

Delegated officer summary:

- The Premises is classified as *possibly contaminated – investigation required* under the *Contaminated Sites Act 2003*
- Leachate from unlined landfill cells has been identified as a source of groundwater contamination currently reported and being investigated under the *Contaminated Sites Act 2003*.
- Leachate emissions from unlined cells are known to be causing contamination of groundwater that is likely to be impacting offsite receptors including non-potable uses of groundwater.

6.2 Modelling and monitoring of landfill gas

The microbial degradation of putrescible waste produces landfill gas (LFG). The composition of LFG varies according to the conditions present within the landfill (aerobic / anaerobic conditions). LFG is generated at different rates throughout the degradation process and usually at the highest rate of generation post-closure of the landfill.

LFG generation modelling has been undertaken using the USEPA landfill gas emissions estimation model (LandGEM) for the existing unlined cells and future cells 2 and 3. The estimated generation of landfill gas from the unlined cells will peak at 6,609,000 m³/year upon closure in 2022 (ASK, 2021). This is equivalent to a peak landfill gas generation rate of 754 m³/hour. For future cells 2 and 3 the estimated generation of landfill gas will peak at 4,887,000 m³/year upon closure in 2042. This is equivalent to a peak landfill gas generation rate of 557 m³/hour (ASK, 2021).

The Licence Holder has contracted Run Energy to install and manage an LFG extraction and monitoring system at the Premises. Findings from landfill gas monitoring for Phases 1 and 2 during 2018 and 2019 indicated that an active extraction (pump) system and LFG flare would be required. Run Energy were therefore engaged to install, monitor and manage an active extraction and flare system. The current flare has the capacity to manage approximately 500 m³/hour of LFG (ASK, 2021).

Run Energy conduct monthly LFG monitoring. As of September 2021, LFG flow rates from Phase 1 were reported to be approximately 125 m³/hour. A larger flare and extraction system may be necessary after Phases 2 and 3 LFG wells are connected to the system.

Landfill gas monitoring results provided with the 2021 annual environmental report indicates significant generation of methane and carbon dioxide within the landfill mass at the premises. A maximum methane concentration of 68.3% and a maximum CO₂ concentration of 37.6% was reported in the in-waste bores. Gas concentrations in the perimeter bores are low, with a maximum methane concentration of 0.8% and a maximum CO₂ concentration of 10.2%. Flow rate reported in the perimeter bores were also low.

BHRC's consultant found that in June 2020, landfill gases were being generated along the southern and western boundaries of the site at concentrations and rates characterising it as "low risk" or Characteristic situation 2, as described in the guideline *Assessment and management of hazardous ground gases* (New South Wales Environment Protection Authority, 2020). In August 2021, an accredited contaminated sites auditor agreed that the risk at the site perimeter is acceptably low, but recommended that ongoing landfill gas monitoring be carried out to inform future proposed changes to the site configuration (such as development of a

composting facility). The auditor also recommended that landfill gas should continue to be effectively collected and managed to limit migration beyond the landfill cells.

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 Background

The key emissions and associated actual or likely pathway during premises construction and operation which have been considered in this decision report are detailed in Table 2 below. Table 2 also details the control measures the applicant has proposed to assist in controlling these emissions, where necessary.

Table 2: Proposed applicant controls

Emission	Sources	Potential pathways	Proposed controls
Construction of lined landfill cells and tyre hardstand			
Dust	Movement of vehicles and operation of machinery	Air / windborne pathway	<p>Watering down of all unsealed trafficable roads.</p> <p>Watering down any dust generating areas during construction and maintaining a water supply (dedicated water cart) on site.</p> <p>Where possible, activities that have high potential for dust generation (excavation, unloading of material etc.) will be halted during adverse weather conditions where strong winds are blowing towards nearby receptors.</p> <p>Dust related complaints will be recorded.</p>
Noise	Movement of vehicles and operation of machinery	Air / windborne pathway	<p>Ensure all vehicles accessing the site use designated access roads.</p> <p>Speed limits must be enforced.</p> <p>Demonstrate equipment will not cause excessive noise generation.</p> <p>Select plant and equipment to minimise noise emissions where possible, whilst maintaining efficiency of function.</p> <p>Residential grade silencers will be fitted and all noise control equipment will be maintained in good order.</p> <p>Maintain all machinery and equipment in proper working order in accordance with the manufacturers' requirements.</p> <p>No activity of heavy machinery outside site operation hours.</p> <p>Prior to any alternative equipment being installed on site, an internal noise assessment will be conducted to ensure that it is in general accordance with the approved parameters.</p> <p>A complaints register is to be maintained.</p>
Operation of landfill cells – limited to maintaining existing landfilled waste mass only			
Noise	Movement of vehicles and operation of	Air / windborne pathway	In accordance with the Landfill Environmental Management Plan:

Emission	Sources	Potential pathways	Proposed controls
	machinery		<ul style="list-style-type: none"> • Machinery operation and transport movements to be scheduled to occur during standard business hours; • All mobile plant used onsite to be regularly maintained; • Speed limits to be enforced; • A Complaints Register to be maintained; and • Complaints to be investigated.
Dust	Movement of vehicles and operation of machinery. Waste deliveries	Air / windborne pathway	In accordance with the Landfill Environmental Management Plan: <ul style="list-style-type: none"> • Entrance and site access roads to be well maintained; • Speed limits to be enforced; • Use of truck mounted water tank and dust suppression equipment; and • Dust emissions must be monitored on a regular basis through visual inspections.
Odour	Decomposition of putrescible waste	Air / windborne pathway	In accordance with the Landfill Environmental Management Plan and capping and post closure management of the landfill in line with the Landfill Closure Management Plan: <ul style="list-style-type: none"> • Waste must remain covered on a daily basis.
Leachate	Decomposition of putrescible waste	Seepage through soil profile	In accordance with the Landfill Environmental Management Plan and capping and post closure management of the landfill in line with the Landfill Closure Management Plan: <ul style="list-style-type: none"> • Directing clean stormwater run-off away from landfill area; • Maintain covering of landfilled waste; and • Maintain intermediate covering of landfilled areas that will be inactive for a period of 90 days or more; and • Progressively constructing the final capping across the site as the final landform is reached.
Contaminated stormwater	Stormwater coming into contact with waste	Overland flow	In accordance with the Landfill Environmental Management Plan: <ul style="list-style-type: none"> • Minimise disturbed areas on site; maintain undisturbed areas and rehabilitated areas as filters for sediment from disturbed sub-catchments; • Establish erosion controls (revegetation, silt fencing etc.) on disturbed areas as required;

Emission	Sources	Potential pathways	Proposed controls
			<p>and</p> <ul style="list-style-type: none"> Ensure that water that has contact with waste in the landfill area does not leave the site and is managed in an environmentally appropriate way by diverting to 'contaminated' stormwater collection infrastructure.
Landfill gas	Decomposition of putrescible waste	Air / windborne pathway	<p>Capping and post closure management in line with the Landfill Closure Management Plan:</p> <ul style="list-style-type: none"> Installation of an active landfill gas collection system; and Buffers between the premises and offsite buildings are to be maintained due to the risk from offsite migration.
Windblown waste	Maintenance of landfill waste mass	Air / windborne pathway	<p>In accordance with the Landfill Environmental Management Plan:</p> <ul style="list-style-type: none"> Maintain covering of landfilled waste; Perimeter fencing shall be maintained; Daily litter collections shall be undertaken around perimeter fencing; and The volumes of litter collected should be recorded to assess the effectiveness of prevention measures.
Vectors	Exposed putrescible waste Ponding of water	Direct impact	<p>In accordance with the Landfill Environmental Management Plan:</p> <ul style="list-style-type: none"> Maintain adequate cover material; Adequate perimeter fencing and gates; Elimination of ponding water on the property; and Vermin control such as baiting and trapping, carried out on a four-month program.
Operation of solid waste depot			
Dust	Movement of vehicles and operation of machinery.	Air / windborne pathway	<p>Speeds limited at the site as per current arrangements (<8 km/h).</p> <p>Watering down of trafficked areas.</p> <p>Transfer station is established on bituminised hardstand.</p>

Emission	Sources	Potential pathways	Proposed controls
	Waste deliveries		Dedicated CDS material collection facility.
Noise	Unloading and loading of waste. Movement of vehicles and operation of machinery.	Air / windborne pathway	Speeds limited at the site as per current arrangements (<8 km/h). Comply with <i>Environmental Protection (Noise) Regulations 1997</i> .
Odour	Decomposition of putrescible waste	Air / windborne pathway	In accordance with the Landfill Environmental Management Plan and capping and post closure management of the landfill in line with the Landfill Closure Management Plan: <ul style="list-style-type: none"> All odour generating wastes delivered to the site must be contained in a covered vehicle; The waste types accepted at the site must be controlled in accordance with the waste acceptance procedure; Not depositing waste in standing water; and Waste must be removed from site within 24 hours.
Contamination of stormwater	Spills of residual liquids	Overland flow	Accept approved CDS materials only. Dedicated CDS material collection facility. Concrete hardstand with gradient towards stormwater sump. Residual liquids will be stored in a 1,000 litre intermediate bulk container (IBC) and disposed of at an appropriately licensed facility. Stormwater will be collected and directed away from waste storage areas. Transfer station is bituminised and has site drainage.
	Stormwater coming into contact with waste	Overland flow	Stormwater will be collected and directed away from waste storage areas. Transfer station is bituminised and has site drainage.
Windblown waste	Temporary storage of uncovered waste	Air / windborne pathway	Perimeter fencing shall be maintained.

Emission	Sources	Potential pathways	Proposed controls
			Daily litter collections shall be undertaken around perimeter fencing. The volumes of litter collected should be recorded to assess the effectiveness of prevention measures.
Vectors	Exposed putrescible waste Ponding of water	Direct impact	Adequate perimeter fencing and gates. Elimination of ponding water on the property. Vermin control such as baiting and trapping, carried out on a four-month program.
Fire/smoke	Upset conditions	Air / windborne pathway	Fire extinguishers located within the CDS shed, and hydrants on the premises. Premises is secured when unattended.
Crushing of building material			
Dust	Placement and operation of crusher	Air / windborne pathway	Onsite extraction bores for dust suppression by wetting down stockpiles and work areas. Factory fitted misters on the crusher to mitigate dust migration.
Noise	Operation of crusher	Air / windborne pathway	Crushing only to occur during site operation hours. Crushing equipment manufactured to Australian Standards restricting decibel output. Compliance with the <i>Environmental Protection (Noise) Regulations 1997</i> .
Asbestos	Unintended asbestos receipt in C&D material	Air / windborne pathway	Onsite extraction bores for dust suppression by wetting down stockpiles and work areas. Factory fitted misters on the crusher to mitigate dust migration. Sporadic campaign-based operations as needed i.e., not standard onsite operations. A 'no asbestos' clause has been established in all contracts with C&D waste suppliers. Visual inspection of loads.
Storage of tyres			
Fire - particulates and noxious gases	Combustion of tyres	Air/windborne pathway	Tyres stored in accordance with Department of Fire and Emergency Services Guidance note: GN02 Bulk Storage of Rubber Tyres. Premises is fenced.

Emission	Sources	Potential pathways	Proposed controls
(smoke)			Regular inspection of the area. No flammables are to be kept within 30 m of the tyre storage area. A dedicated water cart can supply 20,000 L of water through attached firefighting equipment.
Contaminated fire water Contamination of stormwater	Extinguishing of fires Stormwater coming into contact with waste	Infiltration through soil profile	Tyres to be stored on an impermeable, bunded hardstand. In-situ sand will be used to smother fire in the first instance.

7.1.2 Pathways

Emissions and discharges can follow pathways that lead from the premises to the receptors mentioned above. Pathways identified within the local area include prevailing winds, rainfall as overland flow or as leachate to groundwater. These pathways have been considered in the risk assessment in sections 7.2 and 7.5.

Further detail is provided on some of these pathways below. Prevailing wind patterns can provide a direct pathway for transmission of dust and odours by air, so the prevailing wind patterns that may carry these emissions to sensitive receptors have been considered. The closest Bureau of Meteorology (BoM) weather station which records wind frequency data is Bunbury (BoM site 009965). Prevailing winds are from the east in the mornings, and from the west in the afternoon (Figure 2).



Figure 2: Wind rose for Bunbury weather station at 9am and 9pm

A mean annual rainfall of 728.6 mm has been recorded at the Bunbury weather station. The monthly mean rainfall is shown on Figure 3.

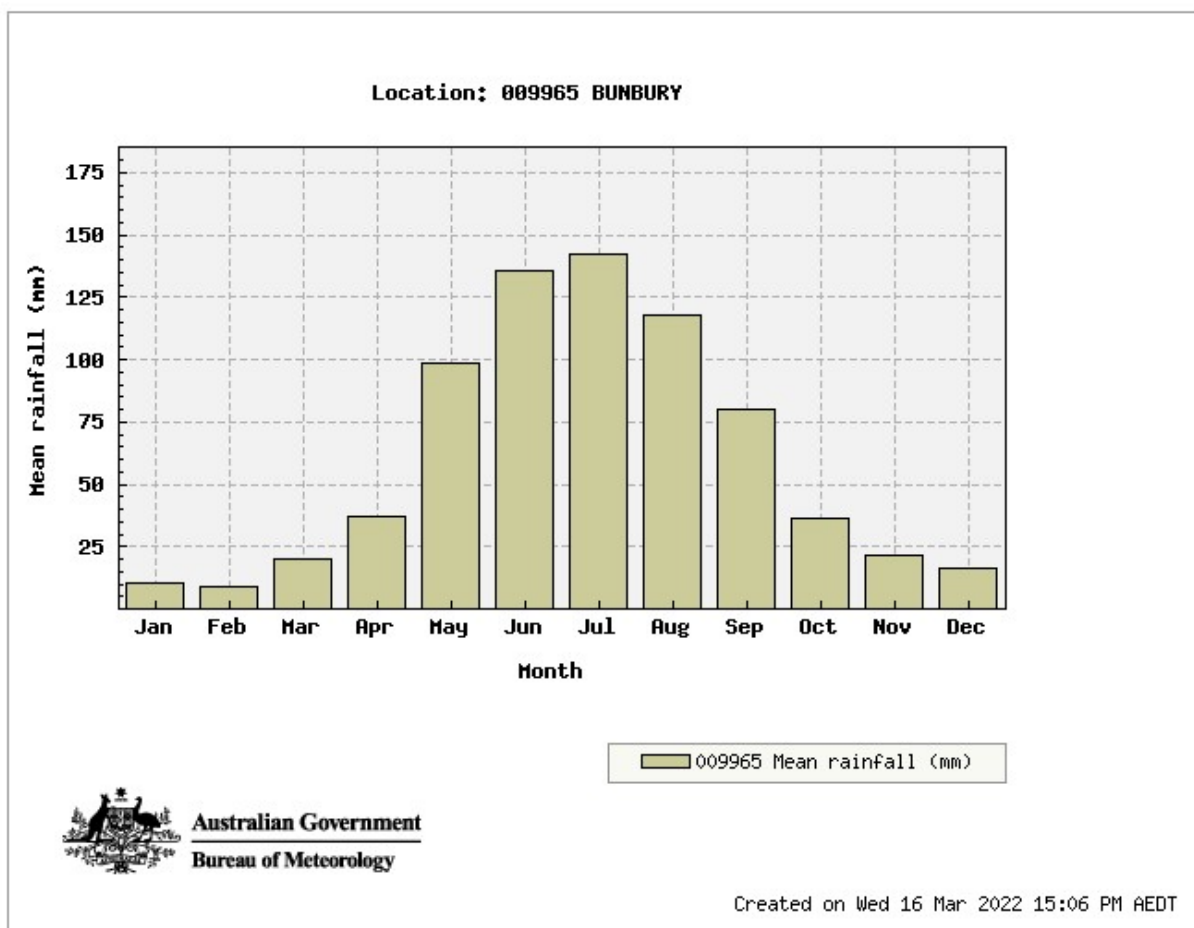


Figure 3: Mean annual rainfall for Bunbury

7.1.3 Geology and hydrogeology

A mandatory auditor’s report (Kirsa, 2021) submitted to the department in August 2021 provided a summary of the local geology and hydrogeology at the site based on the findings of various earlier reports, along with more detailed findings arising from installation of bores as part of the ‘Stage 1’ detailed site investigation (GHD, 2018). Key aspects noted are that the site is located on a thin sequence of sediments on the Swan Coastal Plain, with groundwater bearing formations including the superficial aquifer, with a deeper confined aquifer in the underlying Leederville Formation

Interpretation of drill cores advanced within the premises has indicated a sequence of interbedded sands and clays that separate the superficial aquifer into upper (shallow) and lower (intermediate) portions (Figure 4). The continuity of this separating unit is not currently well understood beyond the premises boundaries, but there is evidence that the clays provide a degree of confinement between the various sand layers, and there may be a downward vertical hydraulic gradient allowing flow from the shallow parts of the superficial aquifer into the intermediate parts of the aquifer.

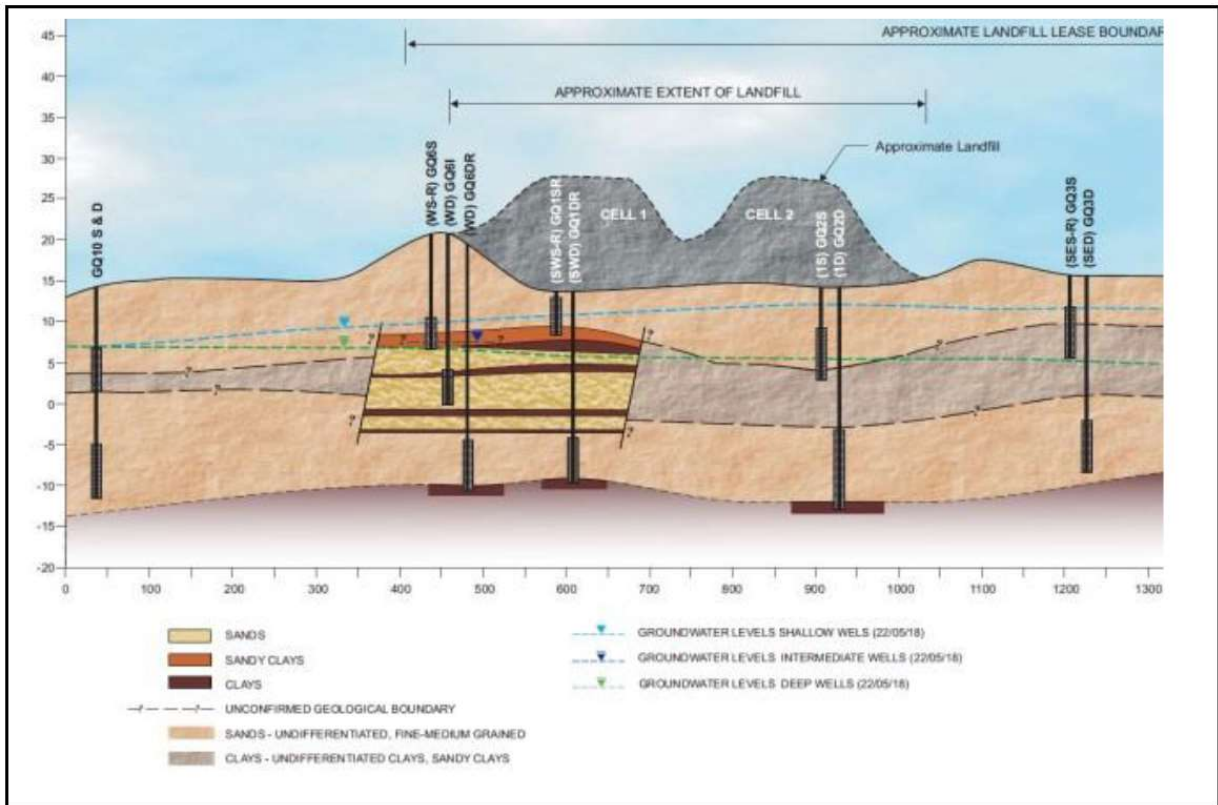


Figure 4: Geological cross-section beneath the premises (source GHD, 2018)

Groundwater sampling across the on-site and off-site bore network to date indicates that groundwater within the shallow superficial aquifer flows generally in a westerly direction. There is evidence of mounding in the vicinity of the unlined cells on the western portion of the landfill site, and this results in a tendency to south-westerly flow south of the site beneath the adjacent property.

Gauging of the intermediate bores to date has indicated a potential southerly flow direction in the intermediate portion of the aquifer, although it should be noted that the network of intermediate bores is not as extensive as the shallow network. Additional bores screened at intermediate depth were installed in late 2021, but the results of the latest sampling round have not yet been made available to the department. Further detail is expected to be provided in the Stage 2 DSI and the MAR, which have not yet been provided to the department.

The current data on groundwater flow indicates a combination of westerly and southerly flow at different levels within the superficial aquifer. The current understanding of groundwater flow direction has changed since the previous risk assessment in December 2019, and the impact on receptors is considered in detail in sections 7.2 and 7.5.

7.1.4 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 and Figure 5 below provide 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 3 below includes drinking water as a potential beneficial use of groundwater because semi-rural dwellings to the south of the Brunswick River are not connected to scheme water.

Department of Health recommends that untreated, untested bore water is not used for drinking water. However, the department is aware of rural and semi-rural dwellings where groundwater may still be used for drinking water purposes. In addition, some of the potential contaminants from landfill leachate (such as PFAS) are unlikely to be included in a landholder's standard water quality testing suite. The Delegated Officer will therefore consider drinking water in the risk assessment in sections 7.2 and 7.5.5.

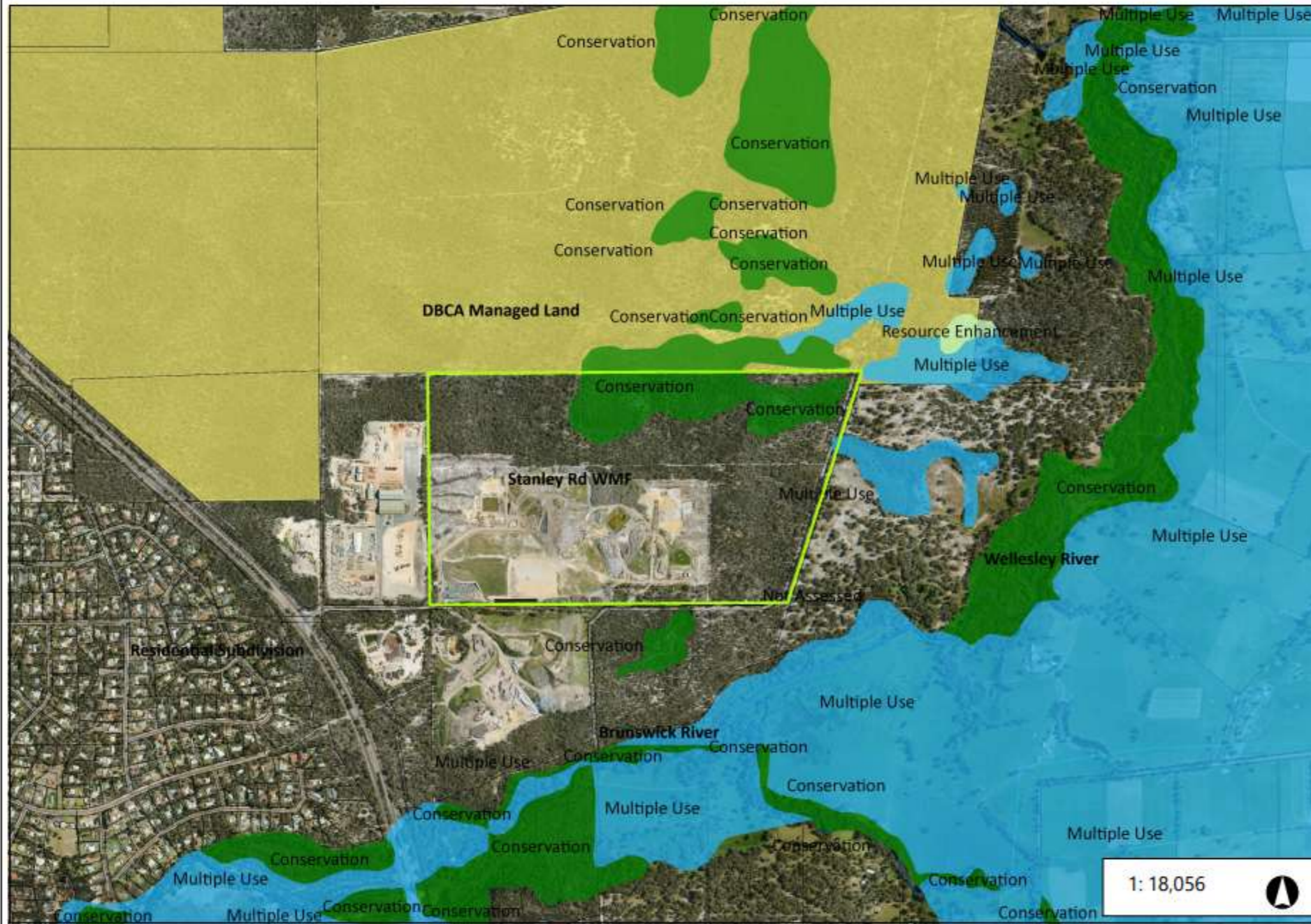
Table 3: Sensitive human, industrial and environmental receptors and distance from prescribed activity

Human receptors	Distance from Premises boundary
Residential Premises (sensitive)	Approximately 535 m west south west from the western side of the premises boundary Approximately 900 m east from the eastern side of the premises boundary.
Semi-rural / agricultural Premises (sensitive)	Approximately 325 m south-east from the south-eastern corner of the Premises boundary. Approximately 550 m south of the southern Premises boundary.
Industrial Premises	Directly adjacent to the west and south.
Environmental receptors	Distance from Premises boundary
<i>Rights in Water and Irrigation Act 1914</i> Proclaimed Groundwater Area	The Premises is within the Bunbury Groundwater Area. More detail on regional and site-specific aquifer is provided in sections 7.1.3 and 6.1.
Beneficial users of groundwater – predominantly non potable ¹ potential drinking water ² use in semi-rural dwellings to the south agricultural irrigation stock watering industrial uses	19 privately owned bores are located within 1 km of the site boundary (DWER GIS – WIN Groundwater Sites) The closest bore is located 690 m south west of the eastern site boundary. One bore located at Sand Mine immediately west of the western site boundary, 210 m from the western site boundary. One bore located at an Inert landfill 115 m south of the southern site boundary (DWER Water Register)
<i>Rights in Water and Irrigation Act 1914</i> Proclaimed Surface Water Area -	Brunswick River and Tributaries – 220 m south
Rivers and Tributaries	Wellesley River 130 m south east of the southern site boundary Brunswick River 430 m south of the southern site boundary. Collie River 5.5 km south west of the southern site boundary
Leschenault Inlet	Leschenault Inlet Management Area 151 m south and 1.9 km west.

Wetlands	<p>Conservation category geomorphic wetlands within premises boundary (northern portion), 100 m north (Dampland), 80 m south (Dampland) and 950 m east (Flood plain) of active landfill area.</p> <p>Multiple Use management category geomorphic wetlands east of the premises extending approximately 25 m inside the premises boundary.</p>
Department of Biodiversity Conservation and Attractions Legislated Land, conservation of flora and fauna and or historical features.	Land reserved under section 5(1)(h) of the <i>Conservation and Land Management Act 1984</i> directly north.
Threatened Ecological Community (Banksia Dominated Woodland of the Swan Coastal Plain)	Within and surrounding the premises.

Note 1. Irrigation of gardens or parks and reserves, washing cars and clothes, flushing toilets.

Note 2. Direct consumption but also applicable to bathing, filling swimming pools, food preparation or cooking.



Legend

- Instruments - Licence
- 4. Geomorphic Wetlands - Swan Coastal Plain (Management)**
 - Conservation
 - Resource Enhancement
 - Multiple Use
 - Not Assessed
 - Not Applicable
- 9. DBCA Legislated Tenure**
 - National Park
 - SCRM ACT - River Reserve
 - Nature Reserve
 - Conservation Park
 - Section 5(1)(g) Reserve
 - Section 5(1)(h) Reserve
 - State Forest
 - Timber Reserve
 - Marine Park
 - Marine Nature Reserve
 - Marine Management Area
 - Section 34A Freehold
 - Crown Freehold - Dept Managed
 - UCL -Managed Under Section 33(2)
 - Rottnest Island Authority Reserve
 - Botanic Garden

Notes

Author:
Recipient:

1.3 0 0.65 1.3 Kilometers

WGS_1984_Web_Mercator_Auxiliary_Sphere
© Government of Western Australia, Department of Water and Environmental Regulation.

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Figure 5: Environmental and sensitive residential receptors

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 licence 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 4.

Exclusions and renewal scope aspects outlined in Section 5 have been considered in the scope of the risk assessment.

Licence L8949/2016/2 that accompanies this decision report authorises emissions associated with the operation of the premises.

The conditions in the issued licence, as outlined in Table 4 have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

Table 4: Risk assessment of potential emissions and discharges from the premises during construction and operation

Risk events					Risk rating ¹ C = consequence L = likelihood	Applicant controls sufficient?	Conditions ² of licence	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
Construction								
Category 64 Construction of lined landfill cells 2 and 3, leachate evaporation ponds, supporting infrastructure Vehicle movements, earthworks, placement of equipment and infrastructure	Dust	Air/windborne pathway causing impacts to health and amenity	Closest residential receptor located ~535 m west south west from the western side of the premises boundary	Refer to Section 7.1.1	C = Slight L = Possible Low Risk	Y	Conditions 1-4, 34-38	N/A
	Noise			Refer to Section 7.1.1	C = Slight L = Possible Low Risk	Y	Conditions 1-4, 34-38	N/A
Category 57 Construction of tyre storage hardstand	Dust	Air/windborne pathway causing impacts to health and amenity	Closest residential receptor located ~535 m west south west from the western side of the premises boundary	Refer to Section 7.1.1	C = Slight L = Possible Low Risk	Y	Conditions 1-4, 34-38	N/A
	Noise			Refer to Section 7.1.1	C = Slight L = Possible Low Risk	Y	Conditions 1-4, 34-38	N/A
Operation								
Burial and decomposition of wastes in unlined cells Acceptance and storage of solid waste, including putrescible waste Crushing of building material	Dust	Air / windborne pathway causing impacts to health and amenity	Closest residential receptor located ~535 m west south west from the western side of the premises boundary	Refer to Section 7.1.1	C = Slight L = Possible Low Risk	Y	Conditions 5-8, 17-26, 34-38	N/A
	Noise			Refer to Section 7.1.1	C = Slight L = Possible Low Risk	Y	Conditions 5-8, 34-38	N/A

Risk events					Risk rating ¹ C = consequence L = likelihood	Applicant controls sufficient?	Conditions ² of licence	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
	Odour			Refer to Section 7.1.1	C = Moderate L = Possible Medium Risk	Y	Conditions 5-10, 14, 15, 34-38	N/A
	Contaminated stormwater and sediment laden stormwater	Overland flow impacting upon the ecosystem function of sensitive waterways Overland flow impacting upon the health and ecosystem function of flora communities	Wetlands to the north, east and south east. Closest being a conservation category wetland located ~100 m north of the unlined landfill cells. Wellesley and Brunswick Rivers. Located ~ 130m southeast and ~430 m south respectively. Threatened Ecological Community within and surrounding the Premises	Refer to Section 7.1.1	Refer to detailed risk assessment of leachate in Section 7.5 below.			

Risk events					Risk rating ¹ C = consequence L = likelihood	Applicant controls sufficient?	Conditions ² of licence	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
	Landfill gas	<p>Lateral migration through soil and groundwater</p> <p>Accumulation in confined spaces (i.e., buildings, utilities) causing explosion or adverse health impacts such as asphyxia</p> <p>Air/wind dispersion of odorous gases causing impacts to amenity</p>	<p>Adjacent industrial premises</p> <p>Closest residential receptor located ~535 m west south west from the western side of the premises boundary</p> <p>Recreational users of the Wellesley and Brunswick Rivers. Located ~ 130m southeast and ~430 m south respectively.</p>	Refer to Section 7.1.1	Refer to detailed risk assessment in Section 7.6 below.			
	Fire - particulates and noxious gases (smoke)	Air/windborne pathway causing impacts to health and amenity	Closest residential receptor located ~535 m west south west from the western side of the premises boundary	Refer to Section 7.1.1	C = Major L = Possible High Risk	Y	Conditions 9, 12, 16, 34-38	N/A

Risk events					Risk rating ¹ C = consequence L = likelihood	Applicant controls sufficient?	Conditions ² of licence	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
	Vermin/vectors	Direct impact causing nuisance and impacting on human health.	Closest residential receptor located ~535 m west south west from the western side of the premises boundary	Refer to Section 7.1.1	C = Moderate L = Unlikely Medium Risk	Y	Condition 10	An additional regulatory control has been added to the revised licence to require the Licence Holder to undertake baiting and trapping on a four monthly basis. This control was added to the licence to align with the licence holder proposed controls outlined in its Landfill Environmental Management Plan.
	Asbestos	Air/windborne pathway causing impacts to health	Closest residential receptor located ~535 m west south west from the western side of the premises boundary	Refer to section 7.1.1	C = Severe L = Rare High Risk	N	Conditions 17 to 25	N/A
	Litter/windblown waste	Air/wind dispersion of waste causing visual amenity and nuisance impacts	Closest residential receptor located ~535 m west south west from the western side of the premises boundary	Refer to Section 7.1.1	C = Slight L = Possible Low Risk	Y	Conditions 8, 9, 11, 34-38	N/A

Risk events					Risk rating ¹ C = consequence L = likelihood	Applicant controls sufficient?	Conditions ² of licence	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
Burial and decomposition of wastes in unlined cells Storage of tyres Crushing of building material	Leachate	Infiltration through soil profile to groundwater causing potential impacts on human health and ecological values of wetlands and waterways, and beneficial uses associated with quality of water in the aquifer	Wetlands to the north, east and south east. Closest being a conservation category wetland located ~100 m north of the unlined landfill cells. Wellesley and Brunswick Rivers. Located ~ 130m southeast and ~430 m south respectively. ~19 privately owned groundwater bores located within 1 km of the premises.	Refer to Sections 7.1.1 and 7.5.3	Refer to detailed risk assessment in Section 7.5 below.			
Storage of used tyres	Fire - particulates and noxious gases (smoke)	Air/windborne pathway causing impacts to health and amenity	Closest residential receptor located ~535 m west south west from the western side of the premises boundary	Refer to Section 7.1.1	C = Major L = Possible High Risk	Y	Conditions 5, 6, 7, 16 and 34-38	N/A

Risk events					Risk rating ¹ C = consequence L = likelihood	Applicant controls sufficient?	Conditions ² of licence	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
	Contaminated fire water Contaminated stormwater	Infiltration through soil profile causing contamination of groundwater	Wetlands to the north, east and south east. Closest being a conservation category wetland located ~100 m north of the unlined landfill cells. Wellesley and Brunswick Rivers. Located ~ 130m southeast and ~430 m south respectively. ~19 privately owned groundwater bores located within 1 km of the premises.	Refer to Section 7.1.1	C = Major L = Possible High Risk	Y	Conditions 5, 6, 7, 16	N/A

Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the *Guideline: Risk Assessments* (DWER 2020). See also Table 5, Table 6 and Table 7 below.

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

7.3 Consequence and likelihood of risk events

A risk rating will be determined for risk events in accordance with the risk rating matrix set out in Table 5 below.

Table 5: Risk rating matrix

Likelihood	Consequence				
	Slight	Minor	Moderate	Major	Severe
Almost certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Medium	Medium	High

DWER will undertake an assessment of the consequence and likelihood of the Risk Event in accordance with Table 6 below.

Table 6: Risk criteria table

Likelihood		Consequence		
The following criteria has been used to determine the likelihood of the Risk Event occurring.		The following criteria has been used to determine the consequences of a Risk Event occurring:		
			Environment	Public health* and amenity (such as air and water quality, noise, and odour)
Almost Certain	The risk event is expected to occur in most circumstances	Severe	<ul style="list-style-type: none"> onsite impacts: catastrophic offsite impacts local scale: high level or above offsite impacts wider scale: mid-level or above Mid to long-term or permanent impact to an area of high conservation value or special significance[^] Specific Consequence Criteria (for environment) are significantly exceeded 	<ul style="list-style-type: none"> Loss of life Adverse health effects: high level or ongoing medical treatment Specific Consequence Criteria (for public health) are significantly exceeded Local scale impacts: permanent loss of amenity
Likely	The risk event will probably occur in most circumstances	Major	<ul style="list-style-type: none"> onsite impacts: high level offsite impacts local scale: mid-level offsite impacts wider scale: low level Short-term impact to an area of high conservation value or special significance[^] Specific Consequence Criteria (for environment) are exceeded 	<ul style="list-style-type: none"> Adverse health effects: mid-level or frequent medical treatment Specific Consequence Criteria (for public health) are exceeded Local scale impacts: high level impact to amenity
Possible	The risk event could occur at some time	Moderate	<ul style="list-style-type: none"> onsite impacts: mid-level offsite impacts local scale: low level offsite impacts wider scale: minimal Specific Consequence Criteria (for environment) are at risk of not being met 	<ul style="list-style-type: none"> Adverse health effects: low level or occasional medical treatment Specific Consequence Criteria (for public health) are at risk of not being met Local scale impacts: mid-level impact to amenity
Unlikely	The risk event will probably not occur in most circumstances	Minor	<ul style="list-style-type: none"> onsite impacts: low level offsite impacts local scale: minimal offsite impacts wider scale: not detectable Specific Consequence Criteria (for environment) likely to be met 	<ul style="list-style-type: none"> Specific Consequence Criteria (for public health) are likely to be met Local scale impacts: low level impact to amenity
Rare	The risk event may only occur in exceptional circumstances	Slight	<ul style="list-style-type: none"> onsite impact: minimal Specific Consequence Criteria (for environment) met 	<ul style="list-style-type: none"> Local scale: minimal to amenity Specific Consequence Criteria (for public health) met

[^] Determination of areas of high conservation value or special significance should be informed by the *Guidance Statement: Environmental Siting*.

* In applying public health criteria, DWER may have regard to the Department of Health's *Health Risk Assessment (Scoping) Guidelines*.

7.4 Acceptability and treatment of risk event

DWER will determine the acceptability and treatment of Risk Events in accordance with the Risk treatment in Table 6 below:

Table 7: Risk treatment table

Rating of Risk Event	Acceptability	Treatment
Extreme	Unacceptable.	Risk Event will not be tolerated. DWER may refuse application.
High	May be acceptable. Subject to multiple regulatory controls.	Risk Event may be tolerated and may be subject to multiple regulatory controls. This may include both outcome-based and management conditions.
Medium	Acceptable, generally subject to regulatory controls.	Risk Event is tolerable and is likely to be subject to some regulatory controls. A preference for outcome-based conditions where practical and appropriate will be applied.
Low	Acceptable, generally not controlled.	Risk Event is acceptable and will generally not be subject to regulatory controls.

7.5 Detailed risk assessment of leachate

7.5.1 Hazard characterisation and impact

Leachate from a putrescible landfill has the potential to harm human health and the environment. It mainly consists of dissolved organic matter and inorganic compounds such as sulfates, chlorides, nutrients (nitrogen and phosphorus) and ammonium salts. Leachate may also contain metals and metalloids, hydrocarbons and synthetic organic compounds such as phthalate esters, phenols, pesticides, herbicides and PFAS.

As noted in Section 4.2 above the Licence Holder has failed to install infrastructure to separate clean stormwater from stormwater that has come into contact with waste. Given the lack of engineered stormwater infrastructure at the premises it is considered that all stormwater falling on unsealed area of the premises has the potential to interact with waste, to pool and consequently seep into groundwater, therefore stormwater will be assessed as leachate. Section 7.1.1 notes that stormwater generated on the sealed areas of site is contained within stormwater infrastructure and as such it is considered that there is no pathway connecting stormwater to groundwater within the solid waste storage area.

The Premises is surrounded by numerous sensitive receptors with the potential to be impacted by leachate including residential, agricultural and industrial premises, conservation significant wetlands, waterways and remnant native vegetation (including Threatened Ecological Communities). Further detail on the nearby receptors, including a list of beneficial users of groundwater, is provided in Table 3 in section 7.1.4.

7.5.2 Criteria for assessment

Considering the relevant receptors as described in section 7.1.4, the following guidelines are considered appropriate consequence criteria for groundwater and surface water in the vicinity of the Premises:

1. Australian Water Quality Guidelines for Fresh and Marine Water Quality ANZECC & ARMCANZ (2000) for slightly–moderately disturbed ecosystems (95% protection level trigger values)
2. Australian Drinking Water Guidelines (NHMRC & ARMCANZ (2011))
3. Guidance values for freshwater ecosystems, drinking water and recreational water, as published in the *PFAS National Environmental Management Plan* (Heads of EPAs Australia and New Zealand, 2020) (the PFAS NEMP).
4. Contaminated Sites Ground and Surface Water Chemical Screening Guidelines Department of Health (DoH 2014).
5. A screening value of 10 times the guidance values for drinking water value as published in the PFAS NEMP, based on guidance published in DoH (2014).
6. Recreational water, short-term and long-term irrigation water, and stock watering (ANZECC & ARMCANZ, 2000)

7.5.3 Licence Holder controls

Section 7.1.1 (Table 2) details the control measures the applicant has proposed to assist in controlling leachate emissions.

The most effective way of minimising leachate emissions from the existing unlined cells is to install capping to prevent rainfall infiltrating into the waste mass. The existing licence required the Licence Holder to prepare and submit an updated Closure and Post-Closure Management Plan by 30 May 2021. The existing licence also required the Licence Holder to undertake capping of the unlined cells by specified dates.

The EPN, issued on 5 July 2021 requires BHRC to provide the department with a revised version of the document Landfill Closure Management Plan (LCMP) that details works required to close the unlined cells at the premises. Further, the EPN requires the Licence Holder to ensure the LCMP is appropriate to control and abate emissions from the landfill, and that the approved LCMP is implemented to give effect to capping and closure of the unlined landfill within the timeframes provided in the LCMP.

The final LCMP was submitted to the department on 30 November 2021 (ASK, 2021a). The LCMP commits to progressively closing and rehabilitating the unlined cells.

The LCMP was produced to achieve the following objectives:

- Ensure that all waste materials are securely covered to mitigate long term environmental impacts and human health risks.
- Development of a final fill profile and slopes that are greater than 1V:20H and less than 1V:5H to:
 - Ensure the long-term stability and integrity of the capping material and containment layer;
 - Promote natural surface water run-off;
 - Provide an aesthetically acceptable landform; and
 - Minimise long term maintenance requirements.
- Development of a final capping system design that meets intended design criteria and minimises leachate generation by preventing the ingress of rainwater into the waste body.
- Development of stormwater and landfill gas control systems and management measures in accordance with Best Practice Landfill Guidelines (ASK, 2021a).

The unlined cells were split into seven phases for staging of the capping works. Capping phases are depicted in Figure 6 below.

It was proposed that an intermediate cap will be placed over Phases 6 and 7 until the engineered connection liners for Cells 2 and 3 are constructed in the next five to ten years. The intermediate capping is to comprise of 300 mm layer of locally sourced material that achieves an average

daily leakage rate of between 3.60 m³/ha/day and 4.7 m³/ha/day (ASK, 2021b).

The department reviewed the revised LCMP and determined that the LCMP remains deficient in some areas and further improvements are required. Formal correspondence was sent to the Licence Holder on 13 May 2022 outlining the improvements that need to be made.

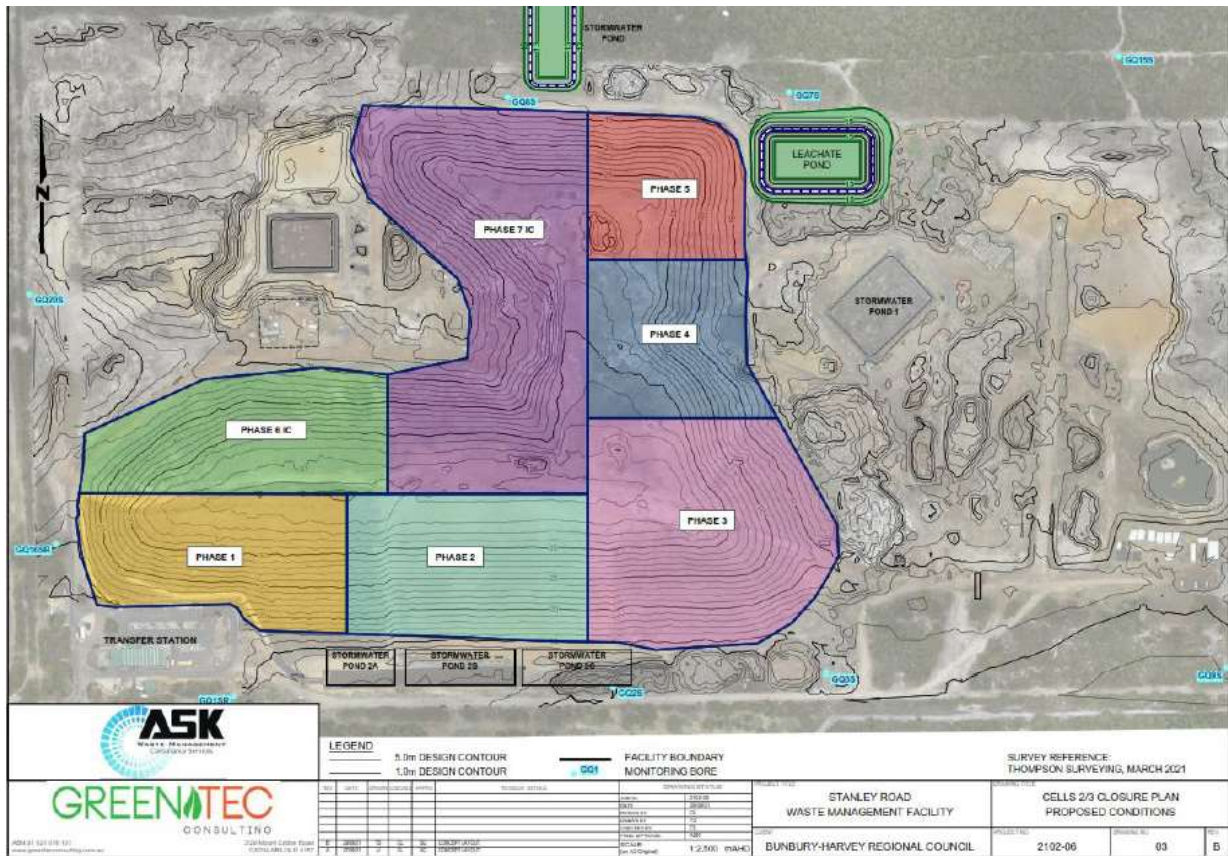


Figure 6: Capping phases for unlined cells

7.5.4 Key findings

The quality of groundwater that is impacted by the leachate plume is discussed in section 6.1. Concentrations of metals and nutrients in groundwater exceed several of the relevant guideline values for the relevant criteria for assessment (section 7.5.2). In this risk assessment, the risk related to migration of leachate emissions has been assessed on the basis of exceedance of specific consequence criteria in shallow, intermediate and deep groundwater beyond the premises boundary.

Previous licence decisions for this premises determined conditions that stipulated timeframes for closure and capping of the unlined cells at the premises. As detailed in section 4.2, the Licence Holder has failed to comply with the conditions that included required timeframes for cessation of landfilling in unlined cells, construction of capping (both intermediate and final capping) and closure of unlined Cells A, B and 1 at the premises.

The emission of leachate from unlined cells is expected to continue for some time following capping and closure of the unlined cells due to the time taken for the existing waste mass to decompose, consolidate and break down. On 5 July 2021, an Environmental Protection Notice (EPN) was given to Bunbury Harvey Regional Council to require it to control or abate emissions of leachate from the unlined landfill cells into groundwater. This risk assessment has considered that leachate emissions will continue to occur in the foreseeable future of operation of the premises, and likelihood has been considered on the basis that the EPN is complied with to support the closure and capping of the unlined landfill cells A, B and 1.

The risk assessment assumes that Cell 1 no longer has capacity to receive additional waste for landfilling, and that on the basis of the current Landfill Environmental Management Plan, that inactive landfill areas will have intermediate cover applied within 90 days of becoming inactive.

The quality of surface water in the Brunswick River is discussed in section 6.1. The recent monitoring results indicate that while the river contains elevated levels of contaminants typically found in leachate emissions, the concentrations in samples taken from upstream and downstream of the premises are consistent. This indicates that if leachate emissions are discharging from the premises to the river, the concentrations may not be significant enough to be detectable in relation to the existing contamination in the river. The MAR is yet to be provided to the department. The risk assessment has considered potential impacts to surface water receptors based on the concentrations of contaminants in groundwater sampled from locations within the premises boundary that are close to the surface water receptors, and the likelihood of pathways existing that connect emission sources to the receptors.

7.5.5 Risk rating of leachate from unlined cells and unsealed areas of the premises

Table 8 Risk rating of leachate from unlined cells

	CONSEQUENCE		LIKELIHOOD OF CONSEQUENCE OCCURRING		RISK ⁸
Receptors	Consequence Rating		Likelihood Rating		
	Rating ⁸	Rationale	Rating ⁸	Rationale	
Beneficial users of groundwater - Drinking Water	Major	<p>Specific Consequence Criteria (for off-site public health) are exceeded.</p> <p>Hydrocarbons, nutrients, metals and PFAS exceed consequence criteria^{1,2} in groundwater at the Premises and down-gradient of the Premises to the west and south-west in an area with access to scheme water for drinking (section 6.1).² Similar impact to groundwater beneath properties to the south, which do not have access to scheme water, cannot be ruled out (sections 6.1 and 7.1.3).</p>	Possible	<p>Groundwater sampled from wells located in the vicinity of the Premises is generally of potable quality³.</p> <p>Sampling was carried out during 2021 at residential irrigation bores on properties to the west and south-west (section 6.1). In one bore, concentrations of PFAS exceeded consequence criteria (drinking water). That residential bore was located in an area with access to scheme water. However, it is possible that semi-rural dwellings to the south are using groundwater for drinking water (section 7.1.4).</p> <p>Gauging of the intermediate bores to date has indicated a potential southerly flow direction in the intermediate portion of the aquifer (section 7.1.3).</p> <p>Further information and interpretation are expected in the Stage 2 DSI and MAR, which are yet to be submitted to the department.</p>	High

	CONSEQUENCE		LIKELIHOOD OF CONSEQUENCE OCCURRING		RISK ⁸
Receptors	Consequence Rating		Likelihood Rating		
	Rating ⁸	Rationale	Rating ⁸	Rationale	
Beneficial users of groundwater - Non potable (industrial and residential)	Major	<p>Specific Consequence Criteria (for off-site public health) are exceeded.</p> <p>Nutrients, metals and PFAS exceed consequence criteria^{4,5} in groundwater at the Premises and down-gradient of the Premises, based on groundwater monitoring carried out up to 2021 (section 6.1).</p>	Likely to Almost Certain	<p>Abstraction bores are down-hydraulic gradient of the landfill in a highly permeable shallow sand aquifer with limited attenuation capacity.</p> <p>Results of the groundwater sampling indicate that non-potable criteria are exceeded in several off-site wells. Non potable use criteria are exceeded at offsite wells at the prescribed premises boundary and at industrial sites to the west and south west of the premises.</p> <p>Groundwater quality results reported under the CS Act represents a point in time assessment of groundwater quality (section 6.1). A considerable degree of uncertainty regarding the risks to off-site users of groundwater will remain until the results of numerous groundwater monitoring events can be assessed.</p>	High to extreme
Beneficial users of groundwater – Agricultural use (irrigation)	Moderate	<p>Specific Consequence Criteria (for off-site public health) are at risk of not being met.</p> <p>Metals exceed consequence criteria in bores at the Premises.⁶ Hydrocarbons and PFAS have also been detected, for which no consequence criteria are available for this receptor.</p>	Possible	<p>Groundwater in the vicinity of the Premises is currently of a quality suitable for agricultural use³. It is possible that semi-rural dwellings to the south are using groundwater for agricultural uses such as irrigation or stock watering (section 7.1.4). Gauging of the intermediate bores to date has indicated a potential southerly flow direction in the intermediate portion of</p>	Medium

	CONSEQUENCE		LIKELIHOOD OF CONSEQUENCE OCCURRING		RISK ⁸
Receptors	Consequence Rating		Likelihood Rating		
	Rating ⁸	Rationale	Rating ⁸	Rationale	
				<p>the aquifer (section 7.1.3).</p> <p>Further detail is expected in the Stage 2 DSI and MAR, which are yet to be submitted to the department. A considerable degree of uncertainty regarding the risks to off-site users of groundwater will remain until the results of numerous groundwater monitoring events can be assessed.</p>	
Wetlands - Conservation category geomorphic wetlands within premises boundary, 100 m north, 80 m south and 950 m east	Severe	<p>Mid to long-term or permanent impact to an area of high conservation value.</p> <p>Contaminant concentrations (chloride, nutrients, metals and PFAS) are significantly greater than consequence criteria at source^{2,7} and are also exceeded within the wetland.</p>	Possible	<p>Contaminants exceeded consequence criteria in monitoring bores within and close to wetland area. Based on the available information, it has been assumed that the wetland is groundwater dependent and any contaminants in groundwater have the potential to impact on the ecosystem of the wetland and surrounding terrestrial ecosystems (refer to Groundwater dependent ecosystem row below).</p>	Extreme
Wellesley and Brunswick Rivers to southeast and south (mapped as conservation category wetlands)	Major	<p>Short-term impact to an area of high conservation value.</p> <p>Contaminant concentrations (chloride, nutrients, metals and</p>	Unlikely	<p>The rivers are located down-hydraulic gradient of the landfill (approximately 130 m at the closest point). Contaminant migration to the river is</p>	Medium

	CONSEQUENCE		LIKELIHOOD OF CONSEQUENCE OCCURRING		RISK ⁸
Receptors	Consequence Rating		Likelihood Rating		
	Rating ⁸	Rationale	Rating ⁸	Rationale	
		PFAS) of groundwater sampled from wells within the premises boundary, approximately 130 m up-gradient of river system at the closest point are significantly greater than consequence criteria ^{2,7}		<p>considered possible in the permeable sand aquifer with limited contaminant attenuation capacity.</p> <p>The preliminary results of surface water sampling provided to the department indicate that the likelihood of groundwater contamination impacting the river may be lower than previously thought. However, uncertainty remains regarding whether a pathway exists to connect the emission source to the rivers. Further information on the degree of connectivity between superficial groundwater and the rivers is expected in the Stage 2 DSI and MAR.</p>	
Wellesley and Brunswick Rivers (agricultural irrigation, stock watering, recreational use)	Moderate	<p>Specific Consequence Criteria (for off-site public health) are at risk of not being met.</p> <p>Contaminant concentrations (chloride, nutrients, metals and PFAS) are significantly greater than consequence criteria^{2,5,6} at the Premises, approximately 130m up-gradient of river system at the closest point.</p>	Unlikely	<p>The rivers are located down-hydraulic gradient of the landfill (approximately 130m at the closest point). Contaminant migration to river is considered possible in the permeable sand aquifer with limited contaminant attenuation capacity.</p> <p>The preliminary results of surface water sampling provided to the department indicate that the likelihood of groundwater contamination impacting the river may be lower than previously thought. However, uncertainty remains. Further information on the degree of connectivity between superficial</p>	Medium

	CONSEQUENCE		LIKELIHOOD OF CONSEQUENCE OCCURRING		RISK ⁸
Receptors	Consequence Rating		Likelihood Rating		
	Rating ⁸	Rationale	Rating ⁸	Rationale	
				groundwater and the rivers is expected in the Stage 2 DSI and MAR.	
Groundwater dependent ecosystem – Banksia Dominated Woodland of the Swan Coastal Plain TEC	Moderate	<p>Specific Consequence Criteria (for the environment) are at risk of not being met.</p> <p>There are no consequence criteria specifically applicable to this receptor and a site-specific risk assessment would be required.</p> <p>Contaminant concentrations (chloride, nutrients, metals and PFAS) at source are significantly greater than the freshwater ecosystem consequence criteria^{2,7} – which have been used in the absence of site-specific criteria for this receptor.</p>	Likely	<p>The TEC is present within and around the property, including at locations where contamination is present in groundwater. Stormwater within the site, which is being assessed as leachate (section 7.5.1), is also likely to come into contact with this TEC within and near to the site.</p> <p>The TEC has not been assessed for changes over time potentially related to contaminated groundwater, and there is the potential for cumulative stressors in the future. Uncertainty remains.</p>	High

Table Notes:

1. Australian Drinking Water Guidelines (NHMRC & ARMCANZ (2011))
2. Guidance values for freshwater ecosystems, drinking water and recreational water, as published in the *PFAS National Environmental Management Plan* (Heads of EPAs Australia and New Zealand, 2020) (the PFAS NEMP).
3. Total dissolved solids (TDS) in monitoring bores outside of main leachate-sourced plume are typically 250–1,500 mg/L. Further detail is expected in the Stage 2 DSI and MAR, which are yet to be submitted to the department.
4. Contaminated Sites Ground and Surface Water Chemical Screening Guidelines Department of Health (DoH 2014).
5. A screening value of 10 times the guidance values for drinking water value as published in the PFAS NEMP, based on guidance published in DoH (2014).
6. Recreational water, short-term and long-term irrigation water, and stock watering guidance values (ANZECC & ARMCANZ, 2000)
7. Australian Water Quality Guidelines for Fresh and Marine Water Quality ANZECC & ARMCANZ (2000) for slightly–moderately disturbed ecosystems (95% protection level trigger values)
8. The risk rating was determined for risk events in accordance with the risk rating matrix and risk criteria set out in Table 5, Table 6 and Table 7 above.

7.5.6 Acceptability of risk event

The Delegated Officer has compared the overall risk described above for leachate from unlined cells with the risk treatment table (Table 7: Risk treatment table) and determined that based on an extreme risk to wetlands (Conservation category geomorphic wetlands within premises boundary, 100 m north, 80 m south and 950 m east), combined with a high and high to extreme risk to the following receptors:

- Beneficial users of groundwater – Drinking water and non-potable uses; and
- Groundwater dependent ecosystem – Banksia Dominated Woodland of the Swan Coastal Plain TEC.

ongoing emission of leachate from the landfill waste mass in unlined cells is unacceptable. It is noted that the likelihood of some risk events associated with migration of the leachate plume remains uncertain and may be addressed by further sampling and interpretation required under the CS Act.

7.5.1 Regulatory controls for leachate from unlined cells

The EPN is the primary instrument that controls and abates pollution from emission of leachate from existing unlined cells. The regulatory controls have been determined so as not to duplicate the requirements of the EPN. It is expected that the Licence Holder will comply with the requirements of the EPN.

Regulatory controls have been added to the revised licence relating stormwater and spills (conditions 13-15), as well as controls for groundwater monitoring (conditions 27-30 and 33) and to require the Licence Holder to report annually (conditions 34-38) the results of groundwater monitoring.

7.6 Detailed risk assessment of landfill gas

7.6.1 Hazard characterisation and impact

Landfill gases are generated through the decomposition of waste within the landfill cell. Landfill gas typically comprises of methane, carbon dioxide, nitrogen, oxygen, hydrogen and many trace gases such as hydrogen sulfide, carbon monoxide, halogenated organics and aromatic hydrocarbons.

Landfill gas can migrate laterally through soil and waste mass, move through groundwater or passively vent to air and cause amenity impacts to nearby human receptors due to odour. Landfill gas in large quantities can also cause adverse health impacts such as asphyxia, or when confined may create an explosion risk. The design of landfill cell capping systems should include consideration of landfill gas generation rates and adequate controls for capture and management of landfill gas in a post-operational environment.

Industrial receptors with the potential to be impacted by landfill gas generation are present immediately adjacent to the west and south of the Premises. Residential and semi-rural receptors are also present within 1 km, as described in Table 3.

7.6.2 Criteria for assessment

The following guidelines are considered appropriate consequence criteria for the assessment of landfill gas emissions at and in the vicinity of the Premises:

- Gas screening values and characteristic situations, as described in the guideline *Assessment and management of hazardous ground gases* (New South Wales Environment Protection Authority, 2020)

The general provisions of the EP Act also make it an offence to cause or allow unreasonable emissions that unreasonably interfere with the health, welfare, convenience, comfort or amenity of any person.

7.6.3 Licence Holder controls

The Licence Holder's contractor has installed and manages a landfill gas extraction and monitoring system. The system is based around an extraction well network with wells spaced approximately 50 metres apart.

The flare currently on site has the capacity to manage approximately 500 m³/hour of landfill gas. As described in section 6.2, the predicted landfill case generation peaks for the unlined cells and future Cells 2 and 3 both exceed the capacity of the current landfill gas flare.

The Licence Holder (via its contractor) conducts monthly landfill gas monitoring of methane and carbon dioxide within the waste mass and along the site perimeter; and gas flow rates along the site perimeter.

Capping and post closure management of landfill gas is intended to be carried out in accordance with the LCMP as described in Table 2. As stated in section 7.5.3, the department has reviewed the most recent version of the LCMP and determined that the LCMP remains deficient in some areas and further improvements are required. Formal correspondence was sent to the Licence Holder on 13 May 2022 outlining the improvements that need to be made.

7.6.4 Key findings

Landfill gas monitoring carried out at the site to date is summarised in section 6.2. The results indicate significant generation of methane and carbon dioxide within the landfill mass. In August 2021, an accredited contaminated sites auditor concluded that the current risk from landfill gas at the site perimeter was acceptably low based on monitoring from June 2020, but that landfill gas should continue to be monitored, effectively collected and managed to limit migration beyond the landfill cells.

The auditor recommended in 2021 that borehole gas flow rates should be monitored within the landfill mass itself (in addition to on the perimeter), to assist in assessing the potential for an advective (pressure driven) lateral landfill gas flows from the waste mass. Landfill gas monitoring results provided with a 2021 annual environmental report did not include "in-waste" gas flow rates. If in-waste gas flow is low, then this may indicate there is insufficient gas pressure to drive advective lateral migration of landfill gas.

As stated in section 7.6.3, the current landfill gas flare does not have adequate capacity to manage the predicted peaks for the unlined cells. An active extraction (pump) system and landfill gas flare would be required to manage the predicted landfill gas generation rates.

7.6.5 Consequence of landfill gas emissions

The Delegated Officer has determined that the impact of landfill gas emissions is that specific consequence criteria (for public health) are at risk of not being met based on the status of the planned construction and connection of landfill gas infrastructure for Cells A, B and 1. Therefore, the Delegated Officer considers the consequence of landfill gas emissions to be **Moderate**.

7.6.6 Likelihood of landfill gas emissions

The current flare is capable of managing landfill gas generated within the landfill gas capture wells currently installed. Based on the predicted landfill gas generation rates, the flare is of inadequate capacity to manage landfill gas generated once infrastructure is installed in the remainder of the unlined cells. Further, the department's review of the current LCMP, has determined that aspects of landfill gas well construction and connection are inadequate for the mitigation of risk associated with gas emissions from the unlined Cells A, B and 1.

Given the emission of gas at a concentration that exceeded public health criteria could occur at some time, the Delegated Officer considers the likelihood of landfill gas emissions causing adverse health effects to be **Possible**.

7.6.7 Overall rating of landfill gas emissions

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 6) and determined that the overall rating for the risk of landfill gas emissions is **Medium**.

7.6.8 Acceptability of landfill gas emissions

The Delegated Officer has compared the overall risk described above for landfill gas with the risk treatment table (Table 7: Risk treatment table) and determined that the risk event is acceptable, subject to regulatory controls.

7.6.9 Regulatory controls for landfill gas

The EPN is the primary instrument that controls and abates pollution from emission of from existing unlined cells and includes requirements for the LCMP to detail the installation and management of landfill gas infrastructure. The regulatory controls have been determined so as not to duplicate the requirements of the EPN. It is expected that the Licence Holder will comply with the requirements of the EPN.

Regulatory controls have been added to the renewed licence (condition 2) for the maintenance of landfill gas infrastructure that has been installed on the premises, and for the monitoring of ambient (perimeter gas wells) and produced landfill gas (in-cell gas wells) (conditions 27-30, 32). Reporting conditions (conditions 34-38) require the Licence Holder to report annually the results of landfill gas monitoring.

The Licence Holder is expected to maintain the premises in a manner that mitigates risk from landfill gas emissions and should landfill gas capture and flaring infrastructure be required to be upgraded in the future, a licence amendment application should be sought to give effect to the installation of the new infrastructure.

8. Consultation

Table 9 provides a summary of the consultation undertaken by the department.

Table 9: Consultation

Consultation method	Comments received	Department response
Application advertised on the department's website on 02/05/2022	Five submissions were received. Refer to Appendix 1 for a summary of the comments provided.	Refer to Appendix 1
Application advertised in <i>The West Australian</i> on 09/05/2022		
Application advertised in <i>The Bunbury Herald</i> on 11/05/2022		
Application advertised in <i>The Bunbury Mail</i> on 10/05/2022		

Consultation method	Comments received	Department response
Application advertised in <i>The South West Times</i> on 19/05/2022		
Stakeholder letters sent to residents on 03/05/2022		
City of Bunbury advised of proposal on 03/05/2022	In an email dated 20/05/2022 the City of Bunbury advised that the City is supportive of the licence renewal as the Stanley Road landfill is a regional facility that is widely used by stakeholders within the surrounding area. The City understands that there are outstanding environmental issues concerning contamination that are being rectified in consultation with DWER, through contemporary conditions being applied to the current facility. Through this process the City believes that any current environmental issues will be addressed.	The Delegated Officer notes this advice and the environmental issues raised have been assessed in the above risk assessment.
Shire of Harvey advised of proposal on 03/05/2022	The Shire of Harvey has verbally advised that the lease agreement between BHRC and the Shire of Harvey and the City of Bunbury has not yet been extended.	The Delegated Officer notes this advice and notes that the Licence Holder is responsible for ensuring the lease is extended prior to it expiring in July 2023.
Applicant was provided with draft documents on 08/06/2022	Comments received via email on 23/06/2022. Refer to Appendix 2 for a summary of comments provided.	Refer to Appendix 2

9. Conclusion

Based on the assessment in this decision report, the delegated officer has determined to partially renew licence L8949/2016/2. Category 62 and Category 13 activities have been renewed with only minor amendments to conditions to correct administrative errors that occurred in previous licence amendment.

In relation to Category 64, conditions allowing the burial of waste at the premises have been removed from the licence (Category 64 remains on licence to allow for the construction of the lined cells). Given the risk assessment, as outlined in Table 7 above, it was determined that the risk to human and environmental health from the continued emission of leachate generated from waste into unlined cells was unacceptable. The Licence Holder is encouraged to expedite closure of the unlined cells and the construction of the contemporary lined cells at the premises. Once the lined cells are constructed, and compliance documentation provided, the Licence Holder can apply to amend the licence to allow landfilling to occur into the new cells. Under the revised licence up to 15,000 tonnes per year of putrescible waste can continue to be accepted at the premises (transfer station only) for temporary storage (24 hours), prior to being transferred offsite to an appropriately licence facility.

Conditions relating to the capping of the unlined cells (inclusive of landfill gas infrastructure) have been removed from the licence as closure and capping works to control and abate emissions from the unlined cells are now regulated by the requirements of the EPN. Once a Landfill Closure Management Plan has been provided to the satisfaction of the CEO the department may amend the licence to reinstate closure conditions. Until such a time, the EPN will be primary instrument for regulating the closure of the unlined cells. It is expected that the Licence Holder will comply with the requirements of the EPN.

The department's Guidance Statement; Licence Duration states that it is the departments preference to issue longer term (20 year) licences to provide greater certainty to industry and to reduce administrative burden on both industry and the department. This guidance statement explains that in determining a licence duration the CEO will have regard to providing the maximum appropriate licence term taking into account a number of factors, including the duration of statutory approvals (such as planning approvals) and the level of risk of harm to public health and the environment posed by the premises. In this instance the Delegated Officer has taken into consideration the risk profile of the site and the history of non-compliance with licence conditions and has determined to renew the licence for five years. After five years the Delegated Officer will review the operation of the premises and any improvements made to consider the acceptability of licence controls for the ongoing operation of the premises.

The Delegated Officer notes that the current lease for the premises expires on 1 July 2023. It is the responsibility of the Licence Holder to ensure that the lease is renewed, and all relevant planning approvals are in place to facilitate on ongoing occupancy and operation of the premises.

References

1. ASK Waste Management Consultancy Services (ASK) (2021a), Landfill Closure Management Plan, Bunbury Harvey Regional Council. November 2021
2. ASK Waste Management Consultancy Services (ASK) (2021b), Intermediate Capping Options for Phases 6 and 7. November 2021
3. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
4. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Perth, Western Australia.
5. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Risk Assessments*, Perth, Western Australia.
6. Department of Water and Environmental Regulation (DWER) 2021, *Guideline: Assessment and management of contaminated sites*.
7. GHD (2018), Bunbury-Harvey Regional Council, Stanley Road Landfill, Detailed Hydrogeological Investigation. July 2018
8. Kirsa (2021) Mandatory Auditor's Report, Additional Investigations Stanley Road Waste Management Facility, 51 Staley Road, Wellesley WA (Kirsa Environmental, 6 August 2021)
9. Talis (2016), Hydrogeological Investigation for Stanley Road Waste Management Facility. July 2016

Appendix 1: Summary of stakeholder comments on the application

Submission No.	Summary of stakeholder comments	Department's response
1 and 2	Concerns were raised relating to leachate and noise from the premises and other sites in the area. Submissions 1 and 2 asked that the licence renewal not be granted and that the site be moved to a designated industrial area.	<p>The Delegated Officer notes the concern relating to leachate and issued the BHRC with an Environmental Protection Notice requiring it to control and abate emissions of leachate from the unlined cells. Landfilling into the unlined cells has ceased and the department is working with BHRC to ensure the unlined cells are capped as a matter of priority.</p> <p>Although the licence has been renewed, landfilling conditions have been removed, effectively leaving the site to operate as a transfer station only until such a time as the lined cells are constructed.</p> <p>BHRC are required to comply with the <i>Environmental Protection (Noise) Regulations 1997</i>.</p>
3	Concerns were raised relating to air pollutants and the amount of dust being generated at this premises and other sites on Stanley Rd. Submission 3 states that the dust generated from this premises is an “extremely dangerous health problem” and a large amount of dust is settling on their homes. Submission 3 says that no measures are being taken to control dust issues and that it would help if less traffic was entering Stanley Rd.	<p>Landfilling conditions have been removed from the Licence and the department is working with BHRC to ensure that the unlined cells are capped as a matter of priority. The cessation of landfilling is anticipated to reduce dust emanating from the premises as it will reduce truck and vehicle movements around the premises.</p> <p>Crushing of inert waste at the premises is the activity most likely to create dust emissions. Crushing at the premises is undertaken on a campaign basis only and the licence contains regulatory controls requiring waste to be maintained in a damp state. Trafficked areas are also required to be wet down to assist in dust suppression.</p>
4	Submission 4 advises that there is a putrid smell that comes from the tip direction. It is noted however that the reduced amount of rubbish (from commercial waste) has made a difference.	<p>The Delegated Officer notes that the odour coming from landfill is likely to reduce with restrictions on the types of waste that can be accepted at the premises. The renewal also no longer permits the acceptance of waste for landfilling at the premises.</p> <p>The licence renewal has removed the landfilling conditions from the licence which will further reduce the odour generated from the premises. An additional regulatory control has been added to the revised licence requiring the licence holder to maintain intermediate cover on landfill areas that have been inactive for a period of greater than 90 days. A regulatory control also exists which requires putrescible waste to only be stored at the premises for 24 hours. These controls will assist in reducing odour emissions from the premises.</p>

Submission No.	Summary of stakeholder comments	Department's response
5	<p>Submission 5 states that as BHRC was responsible for the recent pollution of groundwater they should not have their licence renewed.</p> <p>Submission 5 asked that BHRC give the community assurance that pollution will not occur. Comment was made that BHRC can take some pride in their effort in attempting to address the recycling issues.</p>	<p>The Delegated Officer notes the concern relating to groundwater pollution and issued BHRC with an Environmental Protection Notice to require it to control and abate emissions of leachate from the unlined cells. Landfilling into the unlined cells has ceased and the department is working with BHRC to ensure the unlined cells are capped as a matter of priority.</p>

Appendix 2: Summary of applicant's comments on risk assessment and draft conditions

Condition	Summary of applicant's comment	Department's response
Condition 5, Table 3	<p>The Licence Holder requested to increase the amount of putrescible waste accepted through the transfer station to 15,000 tpa (from 10,000 tpa).</p> <p>The remaining comment period was requested to be waived.</p>	<p>The Delegated Officer has reviewed the risk assessment in regard to the increase in temporary storage of putrescible waste and has determined that the addition of 5,000 tpa will not alter the risk profile of the site. Condition of the licence restrict the storage of putrescible waste to hardstand areas and for 24 hours only. These conditions will be sufficient to mitigate potential emissions of odour and leachate.</p> <p>This increase has changed Category 62 throughput to 35,000 tpa.</p>

Appendix 3: Application validation summary

SECTION 1: APPLICATION SUMMARY (as updated from validation checklist)			
Application type			
Renewal	<input checked="" type="checkbox"/>	Current licence number:	L8949/2016/1
Date application received		2 March 2022	
Applicant and Premises details			
Applicant name/s (full legal name/s)		Bunbury Harvey Regional Council	
Premises name		Stanley Road Class II Putrescible Landfill Site	
Premises location		51 Stanley Rd, Wellesley WA 6233 Lot 45 on Plan 17161	
Local Government Authority		Shire of Harvey	
Application documents			
HPCM file reference number:		DER2016/000056-1~29	
Key application documents (additional to application form):		Signed Renewal Application Form BHRC Licence Renewal Application Supporting Document 8K – Attachment 1A – Combined Title and Lease Extraction 8J – Category 13 Decision Document 8I – Category 57 Decision Document 8H – CDS Decision Document 8G – New Landfill Cells Decision Document 8F – Licence addendum Groundwater Support Memo 8E – CEMP Cell 2-3 8D – LEMP Cell 1 8C – LEMP Cell2-3 8B – 2007 LCMP 30Nov21 8A – GHD Detailed Hydro Report Jul2018	
Scope of application/assessment			
Summary of proposed activities or changes to existing operations.		Renewal only. No changes to existing categories requested. Request to correct administrative errors made in the previous amendment i.e., the omission of household hazardous waste acceptance	

SECTION 1: APPLICATION SUMMARY (as updated from validation checklist)
Category number/s (activities that cause the premises to become prescribed premises)
Table 1: Prescribed premises categories

Prescribed premises category and description	Proposed production or design capacity	Proposed changes to the production or design capacity
Category 13: Crushing of building material	25,000tpa	n/a
Category 62: Solid waste depot	30,000tpa	35,000tpa
Category 64: Class II or III putrescible land fill site	100,000tpa	

Legislative context and other approvals

Has the applicant referred, or do they intend to refer, their proposal to the EPA under Part IV of the EP Act as a significant proposal?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Referral decision No: Managed under Part V <input type="checkbox"/> Assessed under Part IV <input type="checkbox"/>
Does the applicant hold any existing Part IV Ministerial Statements relevant to the application?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Ministerial statement No: EPA Report No:
Has the proposal been referred and/or assessed under the EPBC Act?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Reference No:
Has the applicant demonstrated occupancy (proof of occupier status)?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Certificate of title <input type="checkbox"/> General lease <input checked="" type="checkbox"/> Expiry: July 2023 Mining lease / tenement <input type="checkbox"/> Expiry: Other evidence <input type="checkbox"/> Expiry:
Has the applicant obtained all relevant planning approvals?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>	Approval: Expiry date: The Shire of Harvey has advised that additional development approval is not required
Has the applicant applied for, or have an existing EP Act clearing permit in relation to this proposal?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Existing permits - CPS 5394/5, CPS 7259/2 and CPS 8486/2

SECTION 1: APPLICATION SUMMARY (as updated from validation checklist)

<p>Has the applicant applied for, or have an existing CAWS Act clearing licence in relation to this proposal?</p>	<p>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p>	<p>Application reference No: N/A Licence/permit No: N/A No clearing is proposed.</p>
<p>Has the applicant applied for, or have an existing RIWI Act licence or permit in relation to this proposal?</p>	<p>Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p>	<p>Application reference No: Licence/permit No:GWL170993</p>
<p>Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the EP Act)?</p>	<p>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p>	<p>Name: N/A Type: N/A Has Regulatory Services (Water) been consulted? Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/></p>
<p>Is the Premises situated in a Public Drinking Water Source Area (PDWSA)?</p>	<p>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p>	<p>Name: N/A Priority: P1 / P2 / P3 / N/A Are the proposed activities/landuse compatible with the PDWSA (refer to WQPN 25)? Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/></p>
<p>Is the Premises subject to any other Acts or subsidiary regulations (e.g., <i>Dangerous Goods Safety Act 2004</i>, <i>Environmental Protection (Controlled Waste) Regulations 2004</i>, <i>State Agreement Act xxxx</i>)</p>	<p>Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p>	<p><i>Environmental Protection (Controlled Waste) Regulations 2004</i></p>
<p>Is the Premises within an Environmental Protection Policy (EPP) Area?</p>	<p>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p>	
<p>Is the Premises subject to any EPP requirements?</p>	<p>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p>	

SECTION 1: APPLICATION SUMMARY (as updated from validation checklist)

<p>Is the Premises a known or suspected contaminated site under the <i>Contaminated Sites Act 2003</i>?</p>	<p>Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p>	<p>Classification: <i>contaminated – remediation required</i> Date of classification: 15 September 2021</p>
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Appendix 4: 2019 decision report