Amendment Report

Application for Licence Amendment

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

Licence Number	L6764/1997/14
Licence Holder	Atlas Group Pty Ltd
ACN	009 061 063
File Number	2011/000652-3
Premises	Atlas Group Pty Ltd 501 Alexander Drive MIRRABOOKA WA 6061 Legal description – Lot 820 and 821 on Deposited Plan 404602 Certificate of Title Volume 2941 Folio 371 and 372 As defined by the Premises map and coordinates in Schedule 1 of the Revised Licence
Date of Report	14 September 2022
Decision	Revised licence granted

Jarrod Abrahams
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Date: 2022.09.14 14:20:57 +08'00'

MANAGER WASTE INDUSTRIES
REGULATORY SERVICES
an officer delegated under section 20 of
the *Environmental Protection Act 1986* (WA)

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1. Decision summary

Licence L6764/1997/14 is held by Atlas Group Pty Ltd (Licence Holder) for the Atlas Group Pty Ltd landfill (the Premises), located at 501 Alexander Drive, Mirrabooka. The Premises comprises Lot 820 and Lot 821 on Deposited Plan 404602.

This Amendment Report documents the assessment of potential risks to the environment and public health from proposed changes to the boundary of the Premises. As a result of this assessment, Revised Licence L6764/1997/14 has been granted.

The Revised Licence issued as a result of this amendment consolidates and supersedes the existing Licence previously granted in relation to the Premises. The Revised Licence has been granted in a new format with existing conditions being transferred, but not reassessed, to the new format.

The assessment contained within this Amendment Report does not comprise advice for the purposes of the *Contaminated Sites Act 2003* or the conditions and requirements of approvals issued under the *Planning and Development Act 2005.* The assessment and report are limited to the amendment of licence L6764/1997/14 under the *Environmental Protection Act 1986*.

2. Scope of assessment

2.1 Regulatory framework

In completing the assessment documented in this Amendment Report, the department has considered and given due regard to its Regulatory Framework and relevant policy documents which are available at https://dwer.wa.gov.au/regulatory-documents.

2.2 Application summary

On 22 March 2022, the Licence Holder submitted an application to the department to amend Licence L6764/1997/14 under section 59 and 59B of the *Environmental Protection Act 1986* (EP Act). The application is limited to removing the majority of Lot 820 (approx. ¾) from the existing boundary of the prescribed premises to facilitate remediation and ongoing site management under the *Contaminated Sites Act 2003* (CS Act). Following remediation, Lot 820 is proposed for sub-division into two proposed lots. Proposed Lot 1 (east) is intended for a more sensitive commercial/industrial land-use and proposed Lot 2 (west) is intended for ongoing management. The portion of Lot 820 proposed for removal is no longer required for ongoing operations at the Premises.

Lot 820 comprises an area of historical putrescible waste landfilling at the Premises. Landfilling commenced in the eastern most portion of Lot 820 and progressed westward, prior to cessation and capping in 1997. The historical landfill has been closed for approximately 25 years and all landfilling on the Premises after 1997 has been of inert waste

The portion of Lot 820 to be retained within the Premises boundary contains a landfill gas flare connected to landfill gas extraction wells on Lot 821 which currently remain in operation. All other activities at the premises, being acceptance of inert waste and landfilling, occur within Lot 821.

The existing boundary of the Premises and the reduced boundary proposed in the application are shown on Figure 1 and Figure 2 respectively.

2.3 Consolidation of Licence

As part of this amendment package the department has consolidated the licence by incorporating changes made under the Amendment Notices as summarised in Table 1.

Table 1: Licences consolidated in this amendment

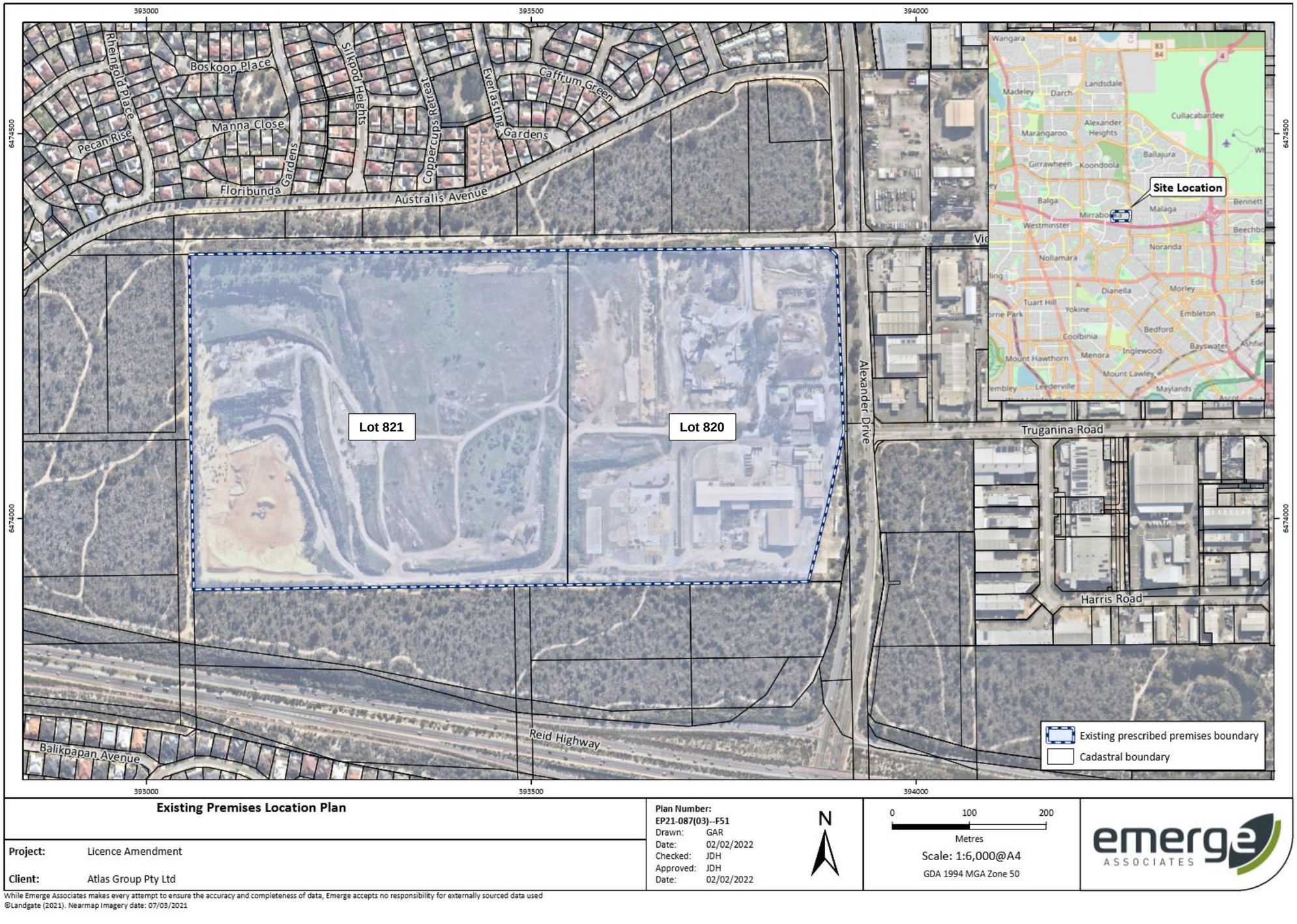
Instrument	Issued	Summary of approval
L6764/1997/14	29/04/2016	Amendment to change expiry date (Notice of Amendment)
L6764/1997/14	02/07/2019	Amendment to revise groundwater monitoring requirements (Amendment Notice 2)
L6764/1997/14	14/09/2022	Amendment to remove the majority of Lot 820 (approx. ¾) from the boundary of the prescribed premises

The department has not undertaken any additional risk assessment of the Premises related to previous Amendment Notices.

In consolidating the licence, the CEO has:

- updated the format and appearance of the Licence, which includes the provision of an infrastructure and equipment table;
- deleted the redundant AACR form set out in Schedule 2 of the previous licence and advised the Licence Holder to obtain the form from the department's website;
- updated condition wording to the current licensing format;
- removed unenforceable terms such as *as soon as practicable*;
- revised licence condition's numbers, removed any redundant conditions and realigned condition numbers for numerical consistency; and
- corrected clerical mistakes and unintentional errors.

The full consolidation of licence conditions as they relate to the Revised Licence are detailed in Section 9.1.2. Previously issued Amendment Notices will remain on the department's website for future reference and will act as a record of the department's decision making.



Existing Premises Location Plan

Project:	Licence Amendment
Client:	Atlas Group Pty Ltd

Plan Number: EP21-087(03)--F51
Drawn: GAR
Date: 02/02/2022
Checked: JDH
Approved: JDH
Date: 02/02/2022

N

0 100 200
Metres
Scale: 1:6,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

Figure 1: Existing Premises boundary

Licence: L6764/1997/14

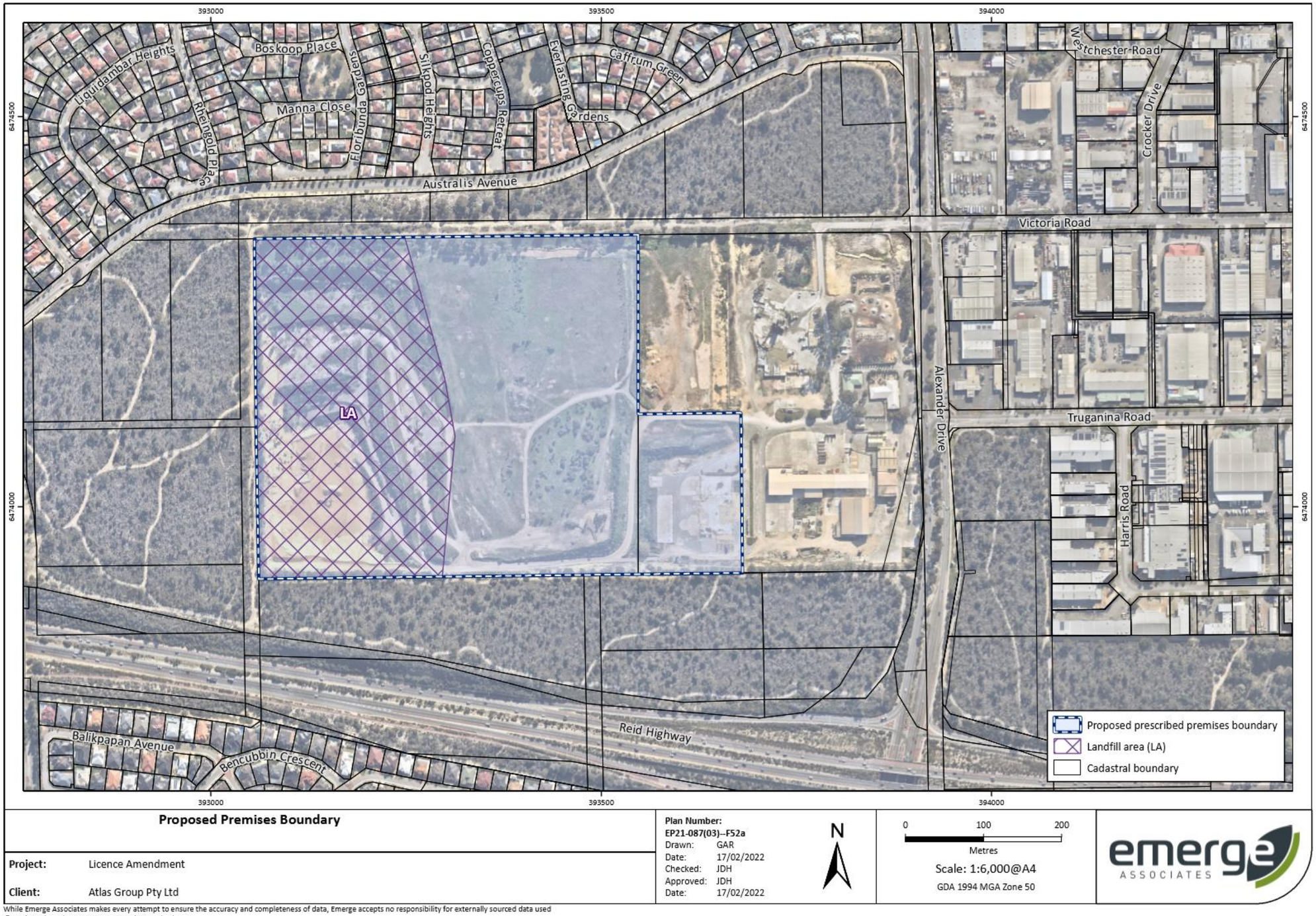


Figure 2: Proposed Premises boundary

Licence: L6764/1997/14

3. Overview of Premises

3.1 Premises summary

The Premises is currently licenced as a *Category 62: Solid waste depot* and *Category 63: Class I inert landfill site* and is comprised of Lot 820 and Lot 821 on Deposited Plan 404602. The Licence Holder has undertaken a number of prescribed activities on the Premises since the 1950s and pre-dating the introduction of the EP Act.

The Premises originally operated as a sand quarry and brick manufacturing facility, prior to the commencement of municipal waste landfilling in 1978. The burial of putrescible waste occurred across both lots within the unlined quarry voids and ceased in 1997 when the putrescible landfill was closed and capped. The historical landfill was capped using a layer of inert material and did not contain an engineered capping system. Only inert wastes were authorised for landfilling on the premises after 1997.

Municipal waste continued to be accepted at the Premises for sorting and transfer to an alternative disposal location. This occurred through a sorting facility which was constructed in 1994. Putrescible waste has not been accepted at the Premises since 2013 and the waste sorting facility has since been decommissioned and removed.

A cement batching plant has operated within the Premises since 1981, which is currently registered to BGC (Australia) Pty Ltd (BGC) under Registration R103/1989/1. A soil and landscaping supply storage yard has also operated within the Premises since 1995. The operation of these activities occurs through entities other than the Licence Holder.

Key findings:

1. The Premises was prescribed under Category 62 for the temporary storage and sorting of putrescible waste prior to offsite disposal. Decommissioning and removal of the waste sorting facility from the Premises did not occur subject to the conditions of a works approval or licence.
2. The waste sorting facility was the method of operation for the receipt, handling and temporary storage of putrescible waste, as well as the primary control for emissions and discharges from that waste.
3. The Delegated Officer considers that the Premises no longer fits the description of a Category 62 prescribed premises and appropriate controls for the acceptance of putrescible waste are not in place.

3.2 Historical operations on Lot 820

Premises operations comprising the sand quarry and brick manufacturing facility commenced in 1958 within the Lot 820 portion of the Premises. The brick manufacturing facility was located in the southeastern area of Lot 820, with quarrying occurring in the central and western portions of the lot. Quarrying within Lot 820 was completed in 1978 and the brickworks ceased operation in 2019.

From 1978 until 1989 the quarry voids were landfilled using municipal and commercial waste from the City of Stirling local government area. Historical aerial imagery indicates that landfilling commenced in the eastern end of the former quarry void and progressed in a westerly direction towards what is now Lot 821. Landfilling after 1989 occurred on Lot 821 only and Lot 820 is considered to contain the oldest waste mass at the Premises.

After the completion of putrescible landfilling within Lot 820, landfill gas extraction wells were installed to manage emissions and provide an energy supply for the brickworks. Gas extraction from the Lot 820 wells ceased more than 10 years ago due to low volumes being generated.

Following the cessation of putrescible landfilling on the premises in 1997, a waste sorting facility was constructed on the southwestern corner of Lot 820 for the acceptance and sorting of unsegregated municipal waste, pending final disposal or reuse. Accepted wastes were mechanically and manually separated into recyclable, organic and inert fractions. The separated fractions were then transported offsite. This activity ceased in 2013 and the facility was decommissioned and removed in 2020. This area of Lot 820 is proposed for retention within the Premises.

Lot 820 is no longer actively used by the Licence Holder for prescribed activities, however the following uses under contractual arrangements with the Licence Holder still occur:

- The north-central portion of the lot is currently occupied by BGC for use as a concrete batching plant. This facility operates as a *Category 77: Concrete batching or cement products manufacturing* prescribed premises under registration R103/1989/1.
- The northeast portion of the lot is used as a landscaping supply business, operated by Soils Aint Soils. This use is not prescribed under Schedule 1 of the Environmental Protection Regulations 1987 (EP Regulations).

The Licence Holder has advised that these activities will not continue after remediation of Lot 820 is complete.

Key findings:

1. Putrescible waste landfilling ceased on the Premises 25 years ago and putrescible landfilling on Lot 820 was concluded approximately 33 years ago. The putrescible landfill material on Lot 820 is likely to be substantially degraded.
2. Acceptance and sorting of unsegregated municipal waste no longer occurs on the Premises or Lot 820 and the area where this occurred is proposed to remain in the Premises boundary.
3. The concrete batching plant on Lot 820 is occupied and operated by another party through Registration R103/1989/1.
4. The Delegated Officer does not consider there to be any activities undertaken by the Licence Holder on Lot 820 that meet the description of a prescribed premises under the EP Regulations.

3.3 Classification under the *Contaminated Sites Act 2003*

The Premises (Lot 820 and 821 on Plan 404602) is classified as *possibly contaminated – investigation required* under section 13 of the *Contaminated Sites Act 2003* (CS Act). This classification was given as there are grounds to indicate soil, groundwater and/or surface water at the site may be contaminated, however, more information is required to confirm or dismiss the possibility of contamination.

The Premises was reported and classified because it was used as a mixed putrescible and industrial landfill for approximately 20 years, from 1977 to 1997. The reasons for classification were updated on 25 February 2014, based on further information submitted to the department by January 2014. The key reasons for classification are as follows:

- A September 2008 compliance inspection found that a diesel spill had occurred on the site. Contaminated soil in the immediate area was removed and disposed however, evidence to demonstrate that remedial works were successful (such as soil sampling to validate the clean-up) was not submitted.
- Landfill gas investigations have not been undertaken at the site, and the current concentrations and flow rates of landfill gas beneath the site are unknown.

- A review of groundwater monitoring data carried out in January 2009, indicated that the site was acting as a source of contamination to downgradient receptors. An Investigation Notice was issued to the landfill operator in October 2011, which set out a number of requirements including off-site groundwater investigation in Dianella and Mirrabooka.
- Further groundwater investigations found that groundwater beneath the Premises and downgradient to the southwest had been impacted by the presence of landfill leachate and contained elevated levels of total dissolved solids (salts), ammonia, chloride, iron, phosphorus and degraded petroleum hydrocarbons.
- A detailed health risk assessment found that contaminant concentrations present in downgradient groundwater did not pose an unacceptable risk to human health, the environment or any environmental value under all land uses. Contaminant concentrations in groundwater beneath the Premises was considered unlikely to pose an unacceptable risk to human health under the current land use however, it may pose a risk under a more sensitive land use.
- A Mandatory Auditor's Report (MAR) generally supported the findings of the detailed health risk assessment but recommended that further investigation (including soil and landfill gas investigation) was required before comment can be made on the suitability of the site as a whole for any land use.

Key findings:

1. The Premises has been reported and classified under the CS Act as *possibly contaminated – investigation required*.
2. The main source of the contamination is related to the historical municipal waste landfill, and not the current activities on the Premises.
3. Contaminant concentrations in groundwater are unlikely to pose an unacceptable risk to downgradient receptors but may be a risk to potential future land-uses at the Premises.

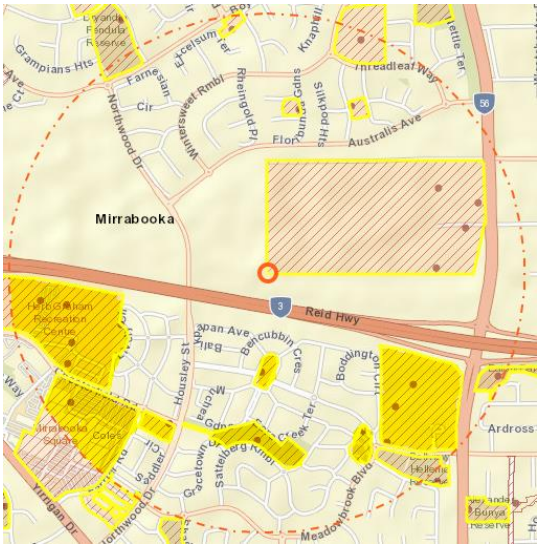
4. Environmental siting

4.1 Receptors

Table 2 below provides a summary of existing 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 2: Human and environmental receptors and distance from prescribed activity

Receptors	Distance from prescribed activity
Human receptors	
Nearest residential receptors – Residential area 1	Approximately 75 m north of the Premises at the northwest Premises boundary
Other residential receptors – Residential area 2	Approximately 190 m south of the Premises at the southwest Premises boundary
Other sensitive receptors – St. Andrew's Grammar School	Approximately 340 m south of the Premises boundary

Receptors	Distance from prescribed activity
Other sensitive receptors – North Metropolitan TAFE	Approximately 1.4 km west of the Premises boundary
Nearest commercial/industrial receptor – Malaga Industrial Area	Approximately 50 m east of the Premises boundary
Environmental receptors	
Underlying groundwater – Superficial Swan (non-potable purposes)	Investigations indicate that groundwater is likely to be present at a depth ranging from 15.2 mBGL to 26.9 mBGL, equivalent to between approximately 26.6 mAHD to 28.1 mAHD. 13 licensed groundwater bores are located within 1 km potentially downgradient of the Premises. The bores are licensed for irrigation of gardens, lawn and turf.  **Figure 3: Licensed groundwater bores within a 1 km radius of the southwest Premises boundary. Properties containing downgradient bores are higlighted yellow**
Public Drinking Water Source Area (PDWSA) – West Mirrabooka Underground Water Pollution Control Area (Priority 3)	The Premises is located within the southern boundary of the PDWSA. The nearest abstraction bore is located approximately 1.25 km upgradient and northwest of the Premises boundary. Groundwater flow at the Premises is southwest to west-southwesterly, directing away from abstraction bores and outside of the PDWSA boundary.
Nearest surface water feature – Geomorphic wetlands of the Swan Coastal Plain - Unnamed basin sumpland (Resource enhancement)	Approximately 470 m southeast of the Premises boundary

Receptors	Distance from prescribed activity
Bush Forever – Site 385: Reid Highway Bushland, Mirrabooka/Malaga	Surrounding the Premises to the north, south and west, with separation by an approximately 5 m firebreak.
Threatened Ecological Community – SCP20a *Banksia attenuata* woodlands over species rich dense shrublands (BC Act [WA]) / Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region (EPBC Act [C'Wth])	
Threatened Fauna – Graceful sun moth (*Synemon gratiosa*) (Priority 4)	The closest recorded occurrence was at approximately 865 m west of the Premises boundary.

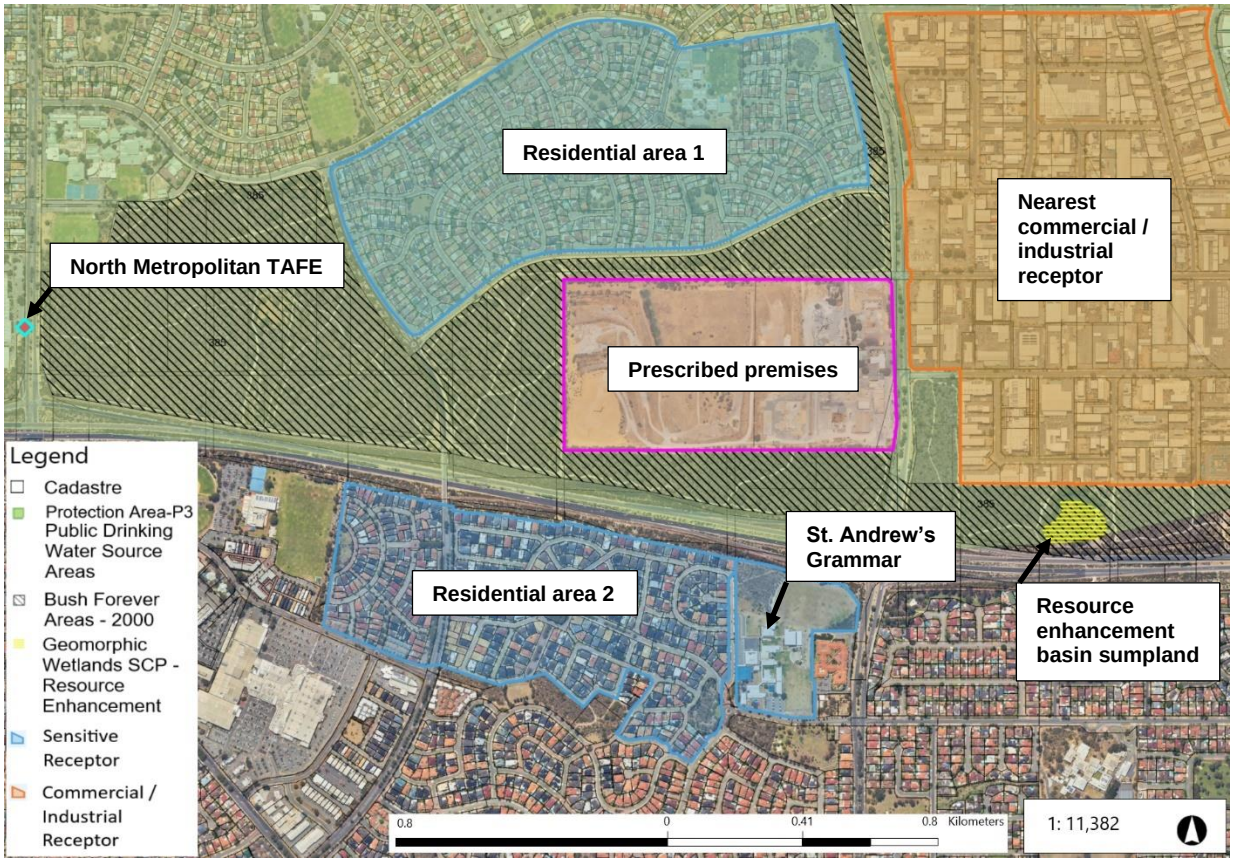


Figure 4: Potential receptors surrounding the Premises

4.2 Pathways

Table 3 below provides a summary of the potential pathways that are considered relevant to emissions and discharges from the prescribed premises *(Guidance Statement: Risk Assessment* (DER 2017)).

Table 3: Pathways and site characteristics relevant to the Premises

Aspect	Details
Geology	The Perth 1:50,000 Environmental Geology sheet indicates the following: • Natural soils underlying the east of the Premises are Bassendean Sands described as very light grey at surface, yellow at depth, fine to medium-grained, sub-rounded quartz, moderately well sorted of eolian origin. • Natural soils underlying the west of the Premises are sand derived from Tamala Limestone which is described as pale and olive yellow, medium to coarse-grained, sub-angular to sub-rounded quartz, trace of feldspar, moderately sorted, of residual origin. Soil underlying the Premises would be highly permeable. An unconfined aquifer system is present within the underlying formation.
Topography	A topographical survey for Lot 821 was conducted in June 2020, indicating the current surface elevation varies from approximately: • 55 – 58 mAHD in the northeast corner adjacent to the Lot 820 boundary. • 58 – 70 mAHD in the central north area. • 70 – 74 mAHD in the northwest corner along the north and west Premises boundary, above the current quarry and inert landfill area. • 50 – 52 mAHD in the southeast corner of Lot 821 adjacent to the Lot 820 boundary. • 52 – 69 mAHD in the central south area of Lot 821. • 64 – 69 mAHD in the southwest corner along the south and west Premises boundary, above the current quarry and inert landfill area. • The current quarry and inert landfill area ranges between 73 mAHD at the highest wall extent to 34 mAHD at the base of the quarry. The current quarry and inert landfill area is stepped down in approximately three stages. A topographical survey for Lot 820 was conducted in August 2021, indicating the current surface elevation varies from approximately (Emerge 2022a): • 43 - 45 mAHD across the majority of the lot in the vicinity of the brickworks, BGC concrete batching plant and Soils Aint Soils yard. • 53 mAHD in the north-west portion in the raised area of the former putrescible landfill. • 48 mAHD along the north-west boundary and 55 mAHD along the southern boundary which comprises the former quarry wall. • 38 mAHD in the undeveloped north-east corner of Lot 820. • Historical quarrying for sand and filling activities has resulted in the majority of the lot being relatively flat. Steep soil batters are evident along the north, west and south boundaries where intersection of the original ground level occurs.

Aspect	Details
Meteorology	The nearest Bureau of Meteorology weather station is the Perth Metro (No. 009225). The station provides the following information: • Based on records from 1994 to 2021, the prevailing wind direction is easterly to north-easterly in the morning (9am), changing direction to south-westerly in the afternoon (3pm). Wind speeds during both periods are typically light according to the Beaufort Wind Scale. • Based on records from 1993 to 2022, the majority of rainfall occurs between May and September, with larger volumes falling during the winter months and peaking in July. The average annual rainfall is 736.8 mm and the highest recorded annual rainfall is 904.8 mm, occurring in 1995.

5. Investigations on Lot 820

A number of investigations have been undertaken across the Premises and also targeted specifically within the area of Lot 820 proposed for removal from the prescribed premises boundary. Intrusive site investigations have assessed the composition, depth and extent of landfill on Lot 820 and the degree to which current and historical activities have resulted in soil, groundwater and landfill gas impacts which may pose a risk to receptors.

5.1 Soil and landfill material

A series of soil investigations have been undertaken at the Premises to determine ground conditions, the extent of the former landfill and potential contaminant impacts at Lot 820. Thirty soil bores and 12 test pits were progressed and sampled across Lot 820 in November and December 2019 (Douglas Partners 2021). An additional 12 soil bores and 33 test pits were progressed in September and October 2021 to better characterise the proposed Lot 1 area, assess suitability of soils for reuse and assess the nature and extent of the former putrescible landfill material and inert fill (Emerge 2022).

5.1.1 2019 Soil Investigations (Douglas Partners 2021)

Sub-surface conditions encountered during the 2019 investigations were found to be natural soils generally comprised of sand, overlain by landfill materials in the western part of Lot 820 and generally by sand fill in the east. A summary of material encountered during the investigation is provided in Table 4.

Table 4: Summary of subsurface conditions encountered during 2019 investigations

Western area subsurface conditions	Eastern area subsurface conditions
Basecourse of gravelly sand with a thickness between 0.4 m and 0.6 m.	Basecourse of gravelly sand with a thickness between 0.3 m and 0.6 m.
Fill sand and gravels with occasional rubble but generally not landfill material. Encountered at depths between 0.1 m and 3.3 m, but generally at less than 1.6 m at most test locations.	
Inert waste fill comprised of rubble including concrete, brick, metal, plastic, wood, glass, tile, pipes, fabric and wire. Encountered at depths between 0.2 m and 3.6 m, but generally less than 2.0 m. The inert waste was generally overlying waste containing putrescible material.	Fill sand and gravels at depths between 0.2 m and 2.7 m at most test locations.

Western area subsurface conditions	Eastern area subsurface conditions
Putrescible waste fill comprised of bin bags containing putrescible household waste, aluminium cans, ceramics, fabric, metal, wood, concrete, brick, plastic, rubber, and rope. Encountered at depths up to approximately 24.2 m below existing surface level. An odour was present from the putrescible fill.	
In-situ sand underlying the landfill material.	In-situ sand underlying either fill or pavement.

5.1.2 2021 Soil Investigations (Emerge 2022)

The 2021 soil investigations further delineated the extent of fill materials across Lot 820, defining the areas of putrescible waste landfill, inert waste landfill, sand fill and in-situ sands.

The majority of the putrescible waste was encountered in the northwestern portion of Lot 820 within the proposed Lot 2 area. This material was generally located at depths between 0.2 – 14 mBGL. Putrescible landfill waste identified in the proposed Lot 1 area was delineated to a location south of the BGC concrete batching plant, within the centre of Lot 820. Putrescible landfill material in this area occurred between depths of 0.8 to 3 mBGL and typically comprised domestic rubbish including plastic bags, bottles, cans, car tyres and tree trunks, and generally did not contain a significant percentage of sand. The southern portion of proposed Lot 1 generally contained inert fill with a minor portion of potentially degraded former putrescible landfill. The sand matrix in this area had a slight organic odour and was typically dark brown to black in colour, however it generally did not contain the other municipal waste components typical of the putrescible landfill material.

Inert fill material was encountered in the south of Lot 820, occurring across both proposed Lots 1 and 2. The material generally occurred up to depths ranging between 12 to 13.5 mBGL (approximately 31 mAHD). The inert material was comprised of concrete, brick, steel, wood and plastic, typical of construction and demolition waste (C&D Waste).

Sand fill material was encountered at depths up to 5 mBGL mainly to the north of the putrescible waste, beneath the BGC concrete batching plant and surrounds. Shallow sand fill was also found to extend into areas along the east of Lot 820. The fill material was observed to be near identical in appearance to the in-situ sand material and generally did not contain any C&D waste or putrescible waste. It was presumed that this material was overburden, excess or unsuitable quarry material from the operations prior to landfilling on the Premises.

In-situ sands were encountered beneath all other types of fill areas across Lot 820 and were considered to be the undisturbed Bassendean Sands forming the base of the historical quarry voids. No staining or odour was observed in this material.

The results of the 2019 and 2021 soil investigations were considered along with information from historical aerials to infer the extent and location of the various fill types across the proposed Lot 1 area. The extent of the fill types are shown on Figure 5.

Key findings:

1. The vertical and lateral extent of the historical landfill across Lot 820 has been delineated into putrescible waste and inert waste areas. Fill areas outside of the landfill footprint were determined to be filled with quarry sand material.
2. The majority of the putrescible waste landfill occurs within the proposed Lot 2 area, with a small footprint extending into the centre of proposed Lot 1. Historical landfill material within proposed Lot 1 is mostly inert waste.

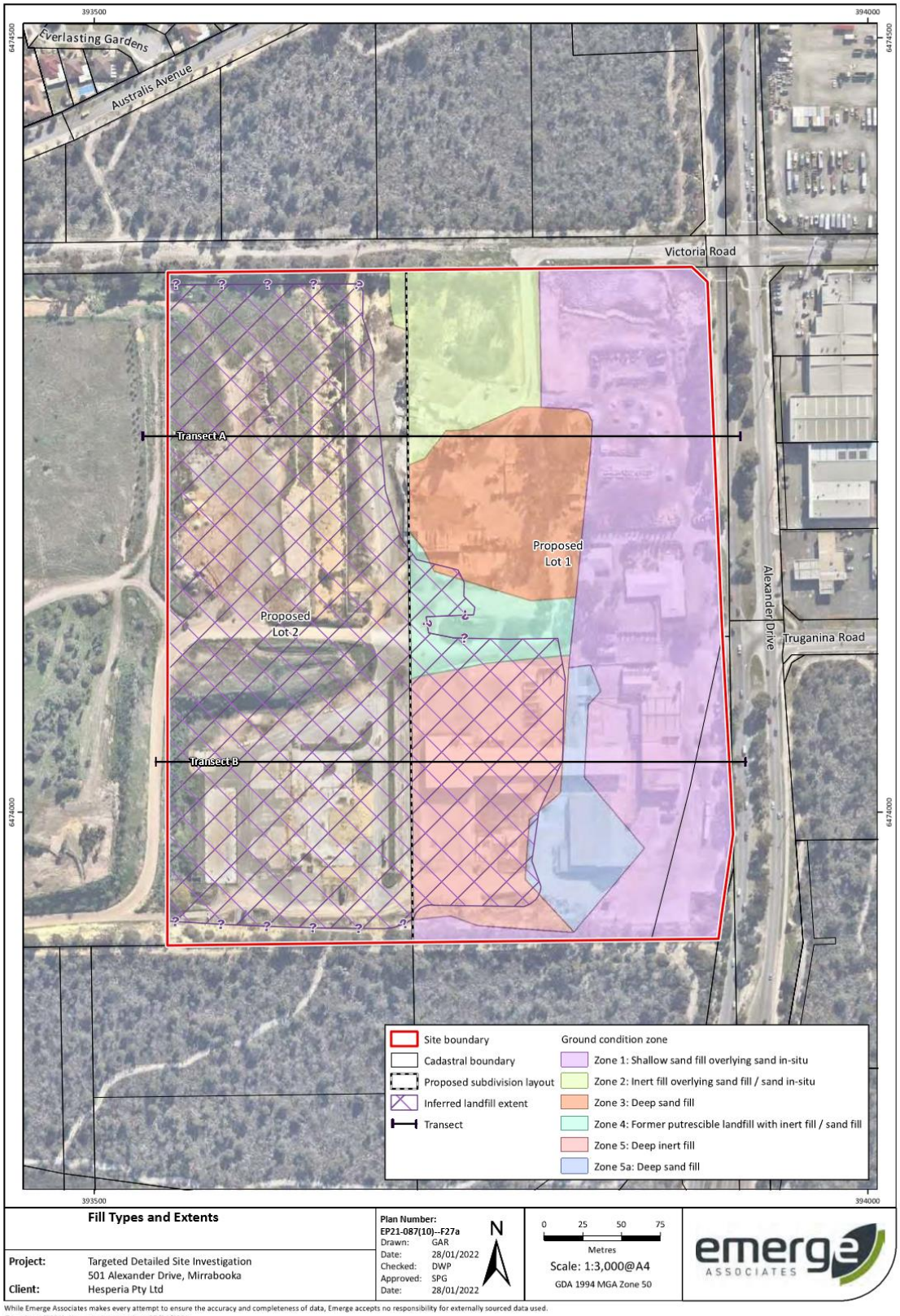


Figure 5: Encountered fill types and inferred extents

5.2 Groundwater

A number of groundwater investigations and monitoring events have been undertaken at the Premises in relation to its status as a contaminated site and as part of monitoring requirements listed on Licence L6764/1997/14. Recent investigations have also been targeted to the Lot 820 area of the Premises.

Groundwater beneath the Premises forms part of the unconfined Perth – Superficial Swan aquifer which overlies the confined Leederville and Yarragadee North aquifers. The base of the superficial aquifer is approximately -10.0 mAHD. Regional groundwater flow direction is southwest, with the direction of local groundwater flow determined from on and offsite monitoring bores as also being to the southwest. Monitoring has indicated that groundwater is present at a depth ranging from 15.2 mBGL (26.6 mAHD) to 26.9 mBGL (28.1 mAHD).

5.2.1 Groundwater quality

Groundwater quality was assessed as part of the 2021 investigations focused on Lot 820 (Emerge 2022). Field monitoring found that TDS was generally higher within wells located in the proximity of the inferred landfill area. A summary of contaminant concentration and exceedances of relevant assessment criteria are contained in Table 5 below.

Table 5: Locations of samples exceeding relevant groundwater criteria (Emerge 2022)

Monitoring bore	Location description	Contaminant concentration and exceedances
MW41	Located at the boundary between Lot 820 and 821, within the landfill area	– 1,690 µg/L total recoverable hydrocarbons (TRH) F2 exceeded the vapour intrusion HSL A – 3,270 µg/L TRH F3 exceeded NPUG criteria – 1.44 mg/L iron exceeded NPUG criteria – 340 mg/L ammonia exceeded NPUG criteria
MW1-6	Located at the centre of the eastern boundary of Lot 820, upgradient of the landfill and opposite a petrol station on the other side of Alexander Drive	– 3 µg/L ethylene benzene exceeded NPUG criteria – 1,940 µg/L TRH F3 exceeded NPUG criteria – 2.18 µg/L perfluoropentanoic acid (PFPeA) – 4.75 µg/L ∑ perfluorohexane sulfonic acid (PFHxS) and perfluorooctanesulfonic acid (PFOS)
EMW01	Located at the boundary between proposed Lot 1 and 2, downgradient of the small area of putrescible landfill that was delineated in proposed Lot 1	– 1.9 mg/L iron exceeded NPUG criteria – 8.19 mg/L ammonia exceeded NPUG criteria
EMW02	Located at the boundary between proposed Lot 1 and 2, south of the BGC concrete batching plant	– 3.76 mg/L iron exceeded NPUG criteria – 0.65 mg/L ammonia exceeded NPUG criteria
MW26	Located at the boundary between Lot 820 and 821, in the southwest corner of Lot 820	– 8.06 mg/L iron exceeded NPUG criteria – 17.3 mg/L ammonia exceeded NPUG criteria

Key findings:

1. Exceedances of the non-potable use criteria for iron and ammonia are related to taste impacts only and are not associated with health impacts. Superficial groundwater use within and downgradient of the Premises is for non-potable purposes.
2. Exceedances of groundwater criteria generally occurs in monitoring bores located within or immediately downgradient of the putrescible landfill areas. Contaminant exceedances outside of these areas at bore MW1-6 may be related to a different upgradient source.

5.3 Landfill gas

5.3.1 Monitoring

A series of landfill gas investigations have been undertaken at the Premises to determine potential impacts at Lot 820. Twenty landfill gas monitoring bores were installed across Lot 820, followed by sampling across three monitoring events in January, February and March 2020 (Douglas Partners 2021). An additional three monitoring bores were installed in 2021 to provide four east-west transects, followed by sampling of 17 bores across a further three monitoring events in October and November 2021 (Emerge 2022).

The highest methane, carbon dioxide, hydrogen sulfide and carbon monoxide concentrations reported during the 2020 monitoring events were 87.3%, 42.8%, 235 ppm and 17 ppm respectively (Douglas Partners 2021). The highest detections of landfill gas components generally occurred within or immediately adjacent to the areas of former putrescible landfill (Douglas Partners 2021).

The 2021 monitoring events recorded maximum concentrations of 72.3% and 36% for methane and carbon dioxide respectively (Emerge 2022). These corresponded to the same locations as the maximums observed during the 2020 events. Maximum hydrogen sulfide and carbon monoxide concentrations were 16 ppm and 11 ppm respectively (Emerge 2022). Low or negligible gas flow was recorded at all monitoring locations (Emerge 2022). The highest landfill gas concentrations were again found to generally occur within or immediately adjacent to the areas of former putrescible landfill, with low concentrations being observed across the majority of proposed Lot 1 (Emerge 2022).

5.3.2 Modelling and risk assessment (EPG 2022)

A consultant was engaged to conduct a landfill gas risk assessment using the monitoring results from the 2020 and 2021 monitoring events. The assessment used a multiple-lines of evidence approach involving a gas balance assessment, semi-quantitative risk assessment, quantitative assessment and development of a conceptual site model for landfill gas. The assessments determined that mitigation measures for landfill gas would be required and a gas mitigation strategy was provided.

The gas balance assessment used the ratios of landfill gas components recorded from monitoring bores comprising the four east-west transects across Lot 820. Ternary plots were created displaying the ratio of methane, carbon dioxide and oxygen. Gas balance ratios shown in the left-hand corner of the ternary plots are typically associated with microbial respiration and mixing of air or carbon dioxide, while plots in the right-hand side are typically associated with landfill gas. Central data points typically indicate methane oxidation. The ternary plots indicated that landfill gas composition in the east of Lot 820 was generally typical of microbial action, while the gas ratios observed at the west of the lot were typical of landfill gas. Data points from bores located near the proposed Lot 1 and 2 boundary showed that methane concentrations appear to be oxidising over a relatively short distance from the landfill waste mass.

A semi-quantitative risk assessment was performed for the proposed Lots 1 and 2, using the maximum observed flow rates and gas concentrations from the previous monitoring events. Gas screening values (GSV) were determined indicating that Lot 2 had a characteristic scenario (CS) of 2, corresponding to a low hazard potential. Proposed Lot 1 returned GSV corresponding mostly to CS1, however one monitoring location had a GSV of CS2. This bore was known to be screened within an area of putrescible waste.

Available evidence suggested that no significant volumes of landfill gas are being generated on proposed Lot 1, based on the general absence of substantially elevated landfill gas concentrations, sustained borehole flows or differential pressures. Where elevated concentrations were detected, this occurred at the western boundary and was attributed to the adjacent waste mass. Information for proposed Lot 2 suggested that some landfill gas continues to be generated, however the generation rate was considered to be low due to its age. The predominant migration mechanism through soil was determined to be a mixture of diffusion and advection (pressure driven gradient) near the landfill mass. Gas flow was expected to diminish due to the advective gradient dissipating over a relatively short distance.

Landfill gas concentrations at potential future receptors located on Lot 1 were modelled using the Johnson and Ettinger model for estimating subsurface vapour/gas intrusion into buildings for advective gas flow. Based on the modelling, the estimated methane concentration in a future commercial receptor on Lot 1 was 5.25 %v/v, which exceeds the methane lower explosive limit of 5% and the 5,000 ppm adopted Action Level for buildings and structures. The model used conservative inputs for a worst-case scenario where the receptor was located 10 m from the landfill mass, with further inhibitions to gas flow such as floor slab construction or oxidation of methane in the subsurface not being considered. The model results indicated that landfill gas mitigation measures will be required at the boundary of proposed Lots 1 and 2.

Key findings:

1. Elevated concentrations of landfill gas observed across Lot 820, occur within or immediately adjacent to the areas of putrescible landfill and are mainly located within the proposed Lot 2 area.
2. Only minor rates of landfill gas are being generated, due to the age of the putrescible waste mass.
3. Modelling indicates there are potential landfill gas risks that require mitigation, however these are related to future use of proposed Lot 1.

6. Regulatory controls other than Part V of the EP Act

6.1 *Planning and Development Act 2005*

Conditional approval for the subdivision of Lot 820 was granted by the Western Australian Planning Commission (WAPC) on 21 February 2022 via Approval No. 161459. The subdivision will divide Lot 820 in half, resulting in a proposed Lot 1 and Lot 2 covering the eastern and western portions respectively. Lot 1 is proposed for a mixed business use (commercial/industrial) and no change in land-use is proposed for Lot 2. The approval is conditional on proposed Lot 1 being remediated of contamination in order to render the area suitable for its proposed commercial land use. Condition 9 of the approval states the following:

> *Prior to commencement of subdivision works, investigation for soil and groundwater contamination is to be carried out for proposed Lot 1 to determine if remediation is required.*

If required, remediation, including validation of remediation, of any contamination identified shall be completed prior to the issuing of titles for proposed Lot 1 on advice from the Department of Water and Environmental Regulation, to ensure that the lots created are suitable for the proposed use.

Investigations and remediation are to be carried out in compliance with the Contaminated Sites Act 2003 and current Department of Water and Environmental Regulation Contaminated Sites Guidelines.

Reference to the Department of Water and Environmental Regulation in the above condition relates to the department's Contaminated Site Branch. The assessment contained within this report does not comprise advice for the purposes of the above condition and is limited to the amendment of licence L6764/1997/14 under the EP Act.

Key findings:

1. Sub-division of Lot 820 is conditional on the successful remediation of contamination from the area.
2. The removal of this area from Licence L6764/1997/14 would not satisfy Condition 9 of the WAPC approval (No. 161459).
3. If the area is removed from the licence, conditions of the sub-division approval provide a regulatory mechanism that will still exist to restrict the occurrence of a more sensitive land-use and location of receptors closer to the Premises.

6.2 *Contaminated Sites Act 2003* and Contaminated Sites Regulations 2006

As previously discussed in Section 3.3, the Premises is classified as *possibly contaminated – investigation required* under the CS Act. The Site includes both Lot 821 and Lot 820. The CS Act and Contaminated Sites Regulations 2006 (CS Regulations) contain a number of provisions that require specific actions to be undertaken by both landowners and regulatory authorities in relation to a reported contaminated site.

Section 58(1) and s.58(2) of the CS Act requires a memorial to be lodged and placed on the certificate of title for land that comprises a site classified as *contaminated – remediation required*, *contaminated – restricted use*, *remediated for restricted use* or *possibly contaminated – investigation required*. A memorial was previously lodged and registered on the certificates of title for both Lot 820 and 821. Certificate of Title Volume 2941 Folio 371 (Lot 820) and Volume 2941 Folio 372 (Lot 821) were provided with the application and both titles are noted as containing memorial K923941 relating to the CS Act.

Section 58(6) of the CS Act prevents the WAPC and other planning authorities from approving the subdivision, amalgamation or development of land under a planning scheme where a memorial exists, without first seeking and taking into account the advice of DWER's Contaminated Sites Branch. Both the WAPC and the City of Stirling have sought advice from DWER's Contaminated Sites Branch on 15 October 2021 and 25 January 2022 respectively, in relation to the subdivision and proposed future development of Lot 820. It is understood that Condition 9 of sub-division approval 161459 (Section 6.1) resulted from this advice.

Regulation 31(1)(c) of the CS Regulations requires a Mandatory Auditor's Report to accompany other reports on the investigation, assessment, monitoring or remediation of a site submitted to DWER as a requirement or condition imposed under another written law. Condition 9 of the sub-division approval triggers this regulation. As a result, an accredited contaminated sites auditor is required to review the investigations and remediation undertaken on Lot 820. A Mandatory Auditor's Report needs to meet specific requirements under r.32 of the CS Regulations.

Contaminated sites auditors are expert contaminated-land professionals that the department accredits under the CS Act to conduct audits in WA. Auditors provide an independent review of the investigations, assessments, monitoring and remedial works undertaken by environmental consultants.

Key findings:

1. The Certificate of Title for both lots comprising the current Premises boundary (Lot 820 and 821) contain a memorial relating to their status as a contaminated site. These memorials can only be removed where the land is formally reclassified as *decontaminated* or *not contaminated — unrestricted use*.
2. DWER's Contaminated Sites Branch has provided advice that sub-division and development approvals for the Lot 820 area are conditional on appropriate remediation and management for proposed future uses.
3. A requirement for oversight and reporting by an accredited contaminated sites auditor has been triggered by sub-division approval 161459. This is required for the investigations of contamination across Lot 820, the planning of remediation work and the subsequent validation of the performed remedial works to ensure the area is suitable for proposed future uses.
4. If the area is removed from the licence, memorials on the title combined with the provisions of the CS Act and Regulations will provide regulatory mechanism to restrict uses and requirement management of the removed area.

6.2.1 Remediation

Landfill remediation (Emerge 2022b)

A Remediation Action Plan (RAP) to partially address the requirements of the sub-division approval and the CS Regulations, has been developed for the area of Lot 820 proposed for removal from the prescribed premises boundary. The remediation works are primarily related to the removal of historical landfill from the proposed Lot 1 area and the area immediately adjacent to the proposed boundary within Lot 2. The RAP will manage the activities relating to the excavation, transport and relocation of landfill materials to demonstrate that the area has been suitably remediated for intended future uses. The remediation process will involve:

- Excavating the former putrescible landfill and inert fill from Zones 2, 3, 4 and 5 (refer to Figure 5) and the batter excavation within proposed Lot 2 to the required depth.
- Validating the base of the excavation where former putrescible landfill or inert fill was removed.
- Relocating the excavated inert fill to an on-site screening area to be temporarily stockpiled, screened and then validated. Validation results will determine the classification of the screened material and where it can be reused. Excess inert fill that doesn't need to be screened to meet the volumes required for fill within proposed Lot 1 will be excavated and relocated for use as backfill of the batter excavation within proposed Lot 2.
- Relocating the former putrescible landfill to the existing landfill areas within the central and western portions of proposed Lot 2.
- Compaction and placement of a 0.5 m layer of cover material over the former putrescible landfill.
- Backfill using virgin or uncontaminated fill across proposed Lot 1 to achieve finished levels.

The remediation works will result in five types of fill being reused or placed in different portions of Lot 820. The fill types and proposed end-use are summarised below:

- Type I: Comprised of virgin excavated sands from the adjacent sand quarry on Lot 821 or imported from an off-site source. This fill type will be reused on any portion of the lot.
- Type II: Comprised of sand fill and in-situ sand required to be excavated for remedial cut-to-fill earthworks. This fill type has been demonstrated to meet the relevant human health assessment levels for the proposed land use and will be reused on any portion of the proposed lots.
- Type III: Comprised of inert fill that has been screened, validated and demonstrated to meet the relevant human health assessment levels for the proposed land use including the assessment levels for ACM. This fill type will be reused:
    - Within proposed Lot 1 with a minimum 0.5 m cover layer of Type I or II fill. Type III fill used within proposed Lot 1 will not contain any visibly black or stained soil.
    - Within proposed Lot 2 at least 5 m west of the landfill gas barrier.
- Type IVa: Comprised of inert fill that has been screened but does not meet the adopted assessment levels for proposed Lot 1. This fill type will be reused within proposed Lot 2 only at a minimum of 5 m west of the proposed Lot 1/ 2 boundary.
- Type IV: Comprised of inert fill that has not been screened. This fill type will be reused within proposed Lot 2 only to backfill the batter excavation.
- Type V: Comprised of former putrescible landfill excavated from proposed Lot 1 and the batter excavation within proposed Lot 2. This will not be screened and will be relocated to the northern and western portions of proposed Lot 2, to be placed on top of the existing former putrescible landfill. Minor volumes will be placed within the batter excavation void at least 10 m west of the proposed Lot 1/ 2 boundary. The excavated former putrescible landfill will be compacted in place and the finished level will be created using 0.5 m layer of Type III or IVa fill or other suitable cover material such as recycled C&D outputs.

The estimated volumes of former putrescible landfill and inert fill to be excavated and placed or remediated from proposed Lot 1 and the batter excavation are as follows:

- 50,000 m^3 to 75,000 m^3 of former putrescible landfill.
- 150,000 m^3 to 200,000 m^3 of inert fill to be either remediated or transported to proposed Lot 2.

A conceptual layout of the fill types within the remediated areas and a design drawing for the relocated fill on proposed Lot 2 are shown in Figure 6 and below.

The finalised remediation activities will be validated through a Remediation Validation Report that includes the results of validation testing, material tracking and surveying. The remediation activities and validation reports will be reviewed by a DWER accredited Contaminated Sites Auditor to determine the success of the remediation and for preparation of a Mandatory Auditor's Report on the activities.

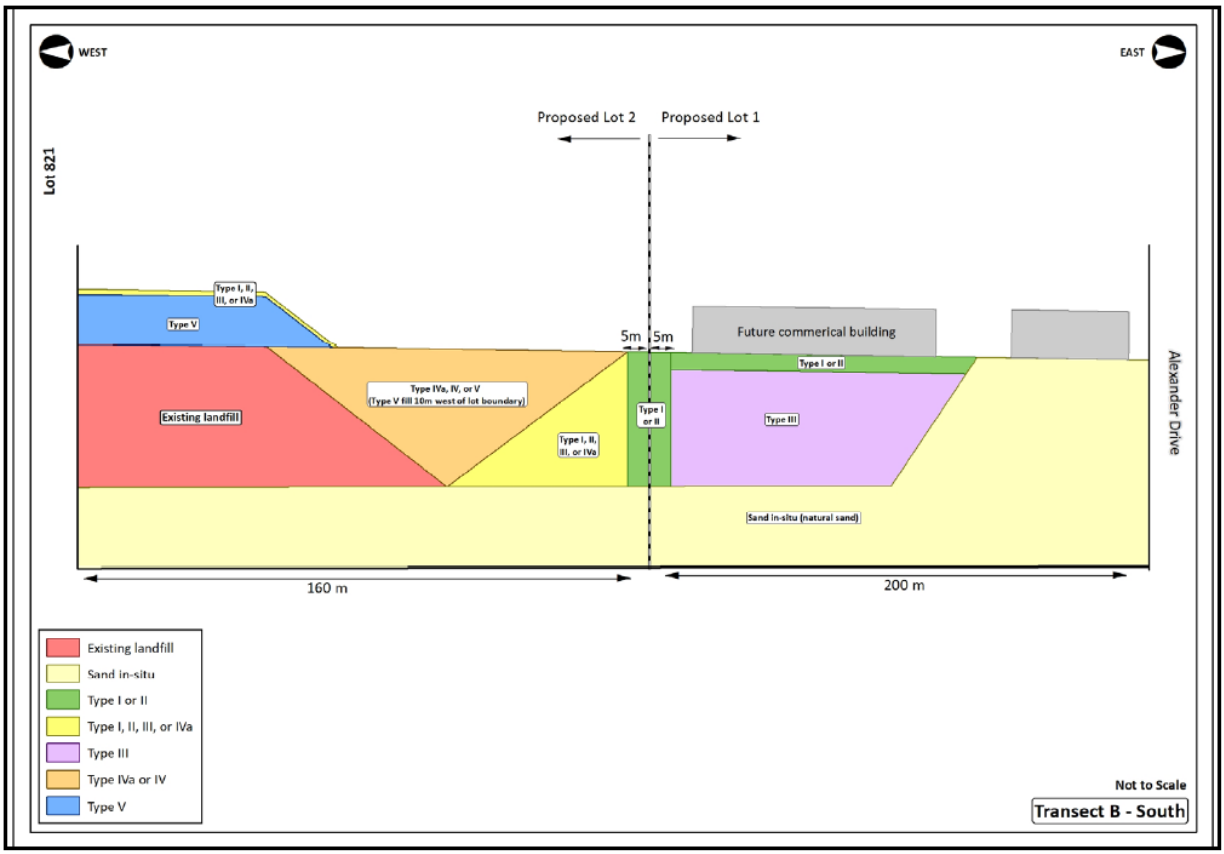


Figure 6: Cross-section and fill layout of the proposed remediation

Key findings:

1. A more sensitive commercial landuse is intended for the eastern area of Lot 820 (proposed Lot 1), however the existing use of the western area of Lot 820 will be retained (proposed Lot 2)
2. All areas of putrescible landfill are intended to be removed from proposed Lot 1 and the adjacent boundary area for relocation above the existing waste mass in the northwest corner of Lot 820 (proposed Lot 2). The waste will be covered according to the existing waste mass.
3. All areas of inert landfill material on proposed Lot 1 will be screened and validated for reuse. Unsuitable material will be removed and relocated above the existing waste mass in the northwest corner of Lot 820 (proposed Lot 2).
4. The finalised remediation works will be validated and documented through a Remediation Validation Report (RVR). The RVR will be reviewed by a DWER accredited contaminated sites auditor.

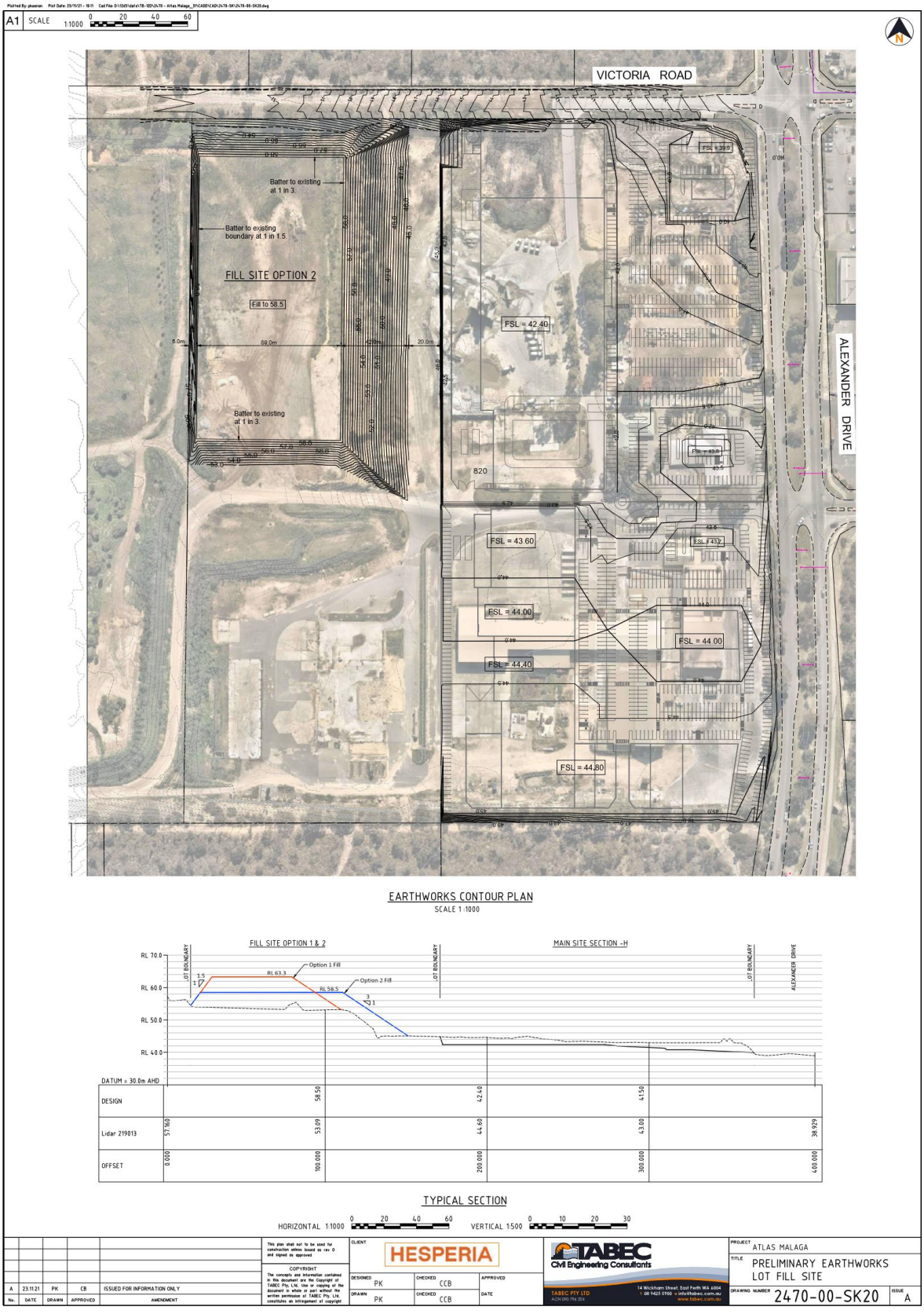


Figure 7: Design drawing for the relocated fill on proposed Lot 2

Landfill gas (EPG 2022)

Remediation and mitigation strategies related to landfill gas have not been included in the RAP (Emerge 2022b) and instead a conceptual design is outlined in the *Landfill Gas Risk Assessment and Gas Remediation Strategy* (EPG 2022).

The conceptual design involves the use of a gas interception barrier (GIB) installed in an easement within proposed Lot 2, adjacent to and along the length of the boundary with proposed Lot 1. The location is within the portion of Lot 820 proposed to be removed from the Premises.

The GIB mitigates landfill gas impacts by closing the pathway for gas migrating laterally towards the proposed Lot 1 and 2 boundary. It achieves this through a series of vertical venting bores typically installed to depths of 75% of the waste mass or to the leachate/groundwater level. The bores are connected via a horizontal pipe installed below ground that transfers landfill gas collected in the bores to an exhaust stack. The system relies on variations in landfill ground pressure and gas concentrations to drive landfill gas and allows the gas to exit the collection system without mechanical assistance. A concept drawing of the system is shown in Figure 8 below.

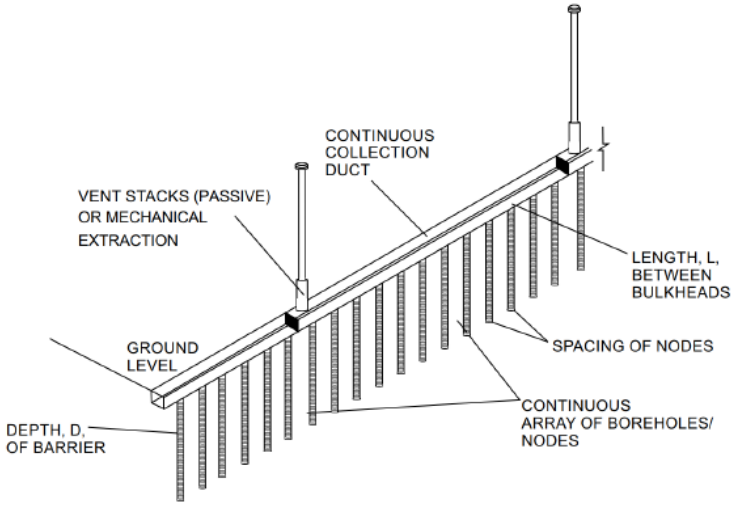


Figure 8: Gas Interception Barrier concept

A passive system that exhausts to air is proposed due to the low flow rates and concentrations of landfill gas observed during previous investigations. However, the system is capable of being converted to an active system with additional odour treatment, should this be required following post installation monitoring.

A Landfill Gas Barrier Specification and Verification Plan will be prepared prior to remediation that provides the detailed specification for the design, location and installation of the landfill gas barrier.

Key findings:

1. Landfill gas risks are proposed to be managed through installation of a passive Gas Interception Barrier (GIB).
2. The GIB reduces potential risks by removing the pathway for lateral migration of landfill gas towards future receptors on proposed Lot 1.

Ongoing site management

Following the successful completion and validation of the remediation, Site Management Plans (SMP) will be prepared for each of the proposed lots. The Lot 1 SMP will detail the restrictions and relevant procedures to be implemented in the event of residual soil and groundwater contamination being encountered or disturbed post-remediation. The Lot 2 SMP will include management of ongoing land-uses within the lot, in relation to the post-remediation landfill material.

A plan will also be prepared for the ongoing operation of the landfill gas barrier. This will document the verification of the effective operation of the landfill gas barrier, a monitoring program and outline responsible parties for operations and maintenance of the GIB.

A commitment to the SMPs by responsible parties and review by relevant stakeholders will be required prior to reclassification of the proposed lots.

Key findings:

1. Restrictions on use and potential risks to ongoing and future landuses will be managed through site management plans for both proposed lots. Responsible parties will be required to commit to enacting the plans before reclassification can occur.

6.2.2 Mandatory auditor's findings

A Contaminated Sites Audit was carried out for the Lot 820 area of the Premises by an auditor accredited by DWER under the CS Act (MR0087), in order to prepare a Mandatory Auditor's Report (MAR). The audit was triggered by the requirements of Condition 9 of the sub-division approval 161459 (Section 6.1), however the auditor had already been engaged on a voluntary basis prior to the sub-division approval being determined. The MAR (AEA 2022) was submitted to DWER on 17 March 2022 and reviewed the following documents:

- *Targeted Detailed Site Investigation, 501 Alexander Drive, Mirrabooka* (Emerge 2022a);
- *Remediation Action Plan - Landfill Remediation: 501 Alexander Drive, Mirrabooka* (Emerge 2022b);
- *Landfill Gas Risk Assessment and Gas Remediation Strategy: Lot 1, 501 Alexander Drive, Mirrabooka WA* (EPG 2022);
- *Human Health Risk Assessment: Proposed Lot 1, 501 Alexander Drive, Mirrabooka WA* (EnRiskS 2022); and
- Various historical reports prepared in relation to the Premises were also reviewed for information purposes only.

A summary of the auditor's key findings (AEA 2022) are contained in Table 6 below.

Table 6: Summary of the auditor's findings (AEA 2022) considered relevant to the historical landfill

Aspect	Auditor's Findings
Soil risks to environment and human health	– Outcomes of the qualitative ecological risk assessment shows that risks from impacted soil to ecological receptors is low. – Outcomes of the qualitative risk assessment for human health shows that risk from impacted inert fill is low. – The majority of samples collected from the inert fill reported concentrations of chemical contaminants suitable for unrestricted use. The inert fill is likely to be suitable for use as structural fill following screening and validation.

Aspect	Auditor's Findings
	– The qualitative risk assessment for soil is robust and adequately assesses potential risks to human health and the environment for the areas investigated. – No further assessment of the landfill material (inert fill and former putrescible landfill material) is required in order to manage risks during bulk earthworks.
Groundwater risks to environment and human health	– Groundwater beneath proposed Lot 1 is generally suitable for non-potable use. – The qualitative risk assessment for groundwater is robust and adequately assesses potential risks to human health and the environment for the areas investigated.
Landfill gas risks to human health	– Verification of the landfill gas calculations show they are satisfactory for Lot 820 to be conservatively characterised as CS2-low risk. – Landfill gas poses a low risk to human health from Lot 820. This is supported by multiple lines of evidence and modelling that uses suitably conservative assumptions and worst-case scenarios. – The qualitative risk assessment shows that removal of the former putrescible landfill material from proposed Lot 1 is required. – Mitigation for landfill gas is required, specifically at the boundary between proposed Lots 1 and 2. – The landfill gas conceptual site model considers risks to proposed Lot 1 only and does not consider off-site risks to the south or north of proposed Lot 2. It is expected that these risks will be assessed as part of future works.
Future use	– Development of proposed Lot 1 should not occur until remediation (removal of former landfill material) and installation of the GIB or other alternative gas mitigation measures have occurred.
Remediation Action Plan (Landfill Remediation)	– The methodologies proposed in the RAP for the validation of former putrescible landfill material and inert fill are considered appropriate. – The RAP provides a robust validation program so that any impacted soils or 'hot spots' identified during remediation will be relocated to proposed Lot 2 for burial, and only soils suitable for use will be reused on proposed Lot 1. – The proposed remediation strategy for the historical landfill area is considered appropriate. The RAP includes adequate controls to manage potential risks to human health and to ensure proposed Lot 1 is rendered suitable for its intended use. – The proposed use of groundwater for dust suppression during the bulk earthworks is considered suitable, provided quarterly monitoring of groundwater quality is undertaken. – Risks to human health from the proposed bulk earthworks is low and acceptable on the understanding that other risk factors (ACM, LFG, odour and unexpected finds) are managed through the RAP and/or a Construction Environmental Management Plan (CEMP) prepared prior to the commencement of works. – The former landfill remediation will require a letter to residents, due to potential dust and odour generation. The letter is to be reviewed by the Auditor.
Landfill Gas Mitigation	– A GIB or other suitable alternative mitigation measure must be installed between the landfill material on proposed Lot 2 and proposed Lot 1. – The design of the GIB should be reviewed and endorsed by the Auditor.

Aspect	Auditor's Findings
	– The use of a GIB is considered a reasonable approach to managing landfill gas as it will break the pathway for gas to migrate to proposed Lot 1. – An Ongoing Site Management Plan (OSMP) will be required in perpetuity to ensure ongoing maintenance and performance of the GIB is continued. Responsible parties will be required to commit to the plan prior to site reclassification. – A stand-alone Landfill Gas Management Plan must be prepared and endorsed by the Auditor to ensure compliance with the landfill gas risk assessment. At a minimum this should include the design, the surveyed location of the proposed GIB or other mitigation strategy, the proposed landfill gas monitoring program and responsible parties for these works. – The design of the GIB should be completed by a suitably qualified person who is able to demonstrate their competence, training and relevant experience.

The Auditor concluded that the performed scope of works and methodology were adequate to characterise the former landfill material present within proposed Lot 1 and to inform the proposed remediation strategy of removal and relocation of the landfill material. The proposed RAP (Emerge 2022b), summarised in Section 6.2.1, was endorsed on the condition that a CEMP and Health, Safety and Environmental Management Plan (HSEMP) are prepared for endorsement by the Auditor. Endorsement was also conditional on an OSMP and Landfill Gas Management Plan being prepared for endorsement by the Auditor.

Additionally, the Auditor considered that further investigations were required in relation to fuel and oil storage areas, brickwork tanks, concrete settling ponds, washdown bays, wastewater treatment ponds, fuel hydrocarbon impacted groundwater and general site activities. These areas are located outside of the historical landfill footprint and relate to secondary or other activities not historically regulated through the Premises' licence.

Key findings:

1. The Auditor has found that there is a low risk to current receptors resulting from historical activities at the Lot 820 area of the Premises.
2. Site Management Plans relating to the ongoing use of the areas proposed for removal from the Premises will be reviewed and endorsed by the Auditor prior to implementation.
3. The further investigations required by the Auditor do not relate to prescribed premises activities and are adequately addressed through the regulatory requirements of the CS Act.

6.2.3 Advice received from DWER's Contaminated Sites Branch

The Delegated Officer has sought advice from DWER's Contaminated Sites Branch, received on 10 May 2022, to inform the assessment of the application. The key considerations in the advice are listed below.

Appropriate management of potential emissions and amenity issues for nearby properties are aspects of remediation work that must be managed in accordance with the guidance provided in Section 13.1 of the department's guideline *Assessment and Management of Contaminated Sites* (DWER 2021). Based on the auditor's recommendations outlined in the MAR, further work will be undertaken prior to implementing the RAP, including development of a CEMP and a HSEMP to manage potential impacts during remediation works.

Given the ongoing oversight of a contaminated sites auditor in accordance with the requirements of the subdivision approval, and the likely placement of similar conditions on any future development approval for proposed Lot 1, the Contaminated Sites Branch does not have any objection to the proposed amendment to Licence L6764/1997/14. Contaminated Sites Branch is satisfied that future works associated with remediation of the site can be appropriately managed under the CS Act.

In relation to the potential risk of landfill gas emissions impacting receptors surrounding the Premises and from Lot 820; to date, landfill gas (LFG) investigations have targeted potential impacts at Lot 820, and have not addressed potential landfill gas generation from the majority of the historical landfill mass located on Lot 821 which will remain within the Premises.

The investigations found that the highest CH4 concentrations were detected in wells located within or adjacent to historical buried putrescible landfill material. The maximum CH_4 concentration (72.3%) was recorded in the central portion of proposed Lot 2. Gas flow rates for all bores across all monitoring events recorded low or negligible flow.

Based on an analysis of Gas Screening Values (GSVs), calculated as outlined in the guidance presented in NSW EPA (2020) and CIRIA Report C665 (2008), all GSV ratings were consistent with a 'very low' risk classification, except for four LFG wells in the central area of Lot 820 that reported a 'low' risk classification. These findings indicate that gas mitigation measures will need to be developed and implemented to support future development of commercial buildings at proposed Lot 1.

However, the findings of LFG investigations to date do not indicate that there is currently any unacceptable risk that lateral migration of LFG from Lot 820 will impact off-site receptors. The risk profile for off-site receptors could change if future development is not properly managed; however, this is expected to be assessed and managed under the provisions of the CS Act and through relevant planning conditions on future development works.

Contaminated Sites considers that the proposed change to the premises boundary is unlikely to impact the groundwater monitoring conditions currently outlined in Licence L6764/1997/14. The area proposed to be excised from the premises is located on the up-gradient portion of the landfill facility, and only one monitoring well (MW1-5) is located within the excised area. That well serves as an upgradient (background) well and as such it should remain as part of the groundwater monitoring network for the premises.

Key findings:

1. There is no indication of any unacceptable risk that lateral migration of landfill gas from the existing state of Lot 820 will impact off-site receptors.
2. The requirement for a mandatory contaminated sites auditor provides a level of oversight for the remediation works that would not be present if they were managed under licence L6764/1997/14 or a separate works approval.
3. If the area of Lot 820 is removed from the licence, the CS Act provides an adequate regulatory mechanism to manage potential emissions and discharges from Lot 820 during and post-remediation.

7. Risk assessment

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

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

7.1 Source-pathways and receptors

7.1.1 Emissions and controls

The key emissions and associated actual or likely pathway during operation of the Premises, following the proposed removal of the Lot 820 area, which have been considered in this Amendment Report are detailed in Table 7 below. Table 7 also details the control measures the Licence Holder has proposed to assist in controlling these emissions, where necessary.

Table 7: Licence Holder controls

Emission	Sources	Potential pathways	Proposed controls
Odour	Acceptance of inert waste and disposal via landfilling Historical municipal waste landfill	Air / windborne pathway	No proposed change to existing controls, however a gas intercept barrier and other management controls will occur off-premises under the CS Act
Landfill gas			
Leachate		Infiltration through soil to groundwater Abstraction of groundwater for beneficial use	No proposed change to existing controls
Noise	Acceptance of inert waste and disposal via landfilling	Air / windborne pathway	No proposed change to existing controls
Dust			
Asbestos			
Smoke and particulates	Abnormal operations (fire event)		

7.1.2 Changes to potential receptors

Table 8 below provides a summary of the new potential human and environmental receptors that may be impacted during Premises operations as a result of the proposed change to the Premises boundary and future development of Lot 820 *(Guideline: Environmental siting* (DWER 2020)). These receptors are additional to those contained in Table 2 (Section 4.1)

Table 8: New human and environmental receptors and distance from prescribed activity

Receptors	Distance from prescribed activity
Human receptors	
Nearest commercial/industrial receptor – Mixed business use on proposed Lot 1	Approximately 25 m east of the proposed southeast boundary of the Premises and approximately 500 m east of the inert landfill area.
Environmental receptors	
No change to environmental receptors	

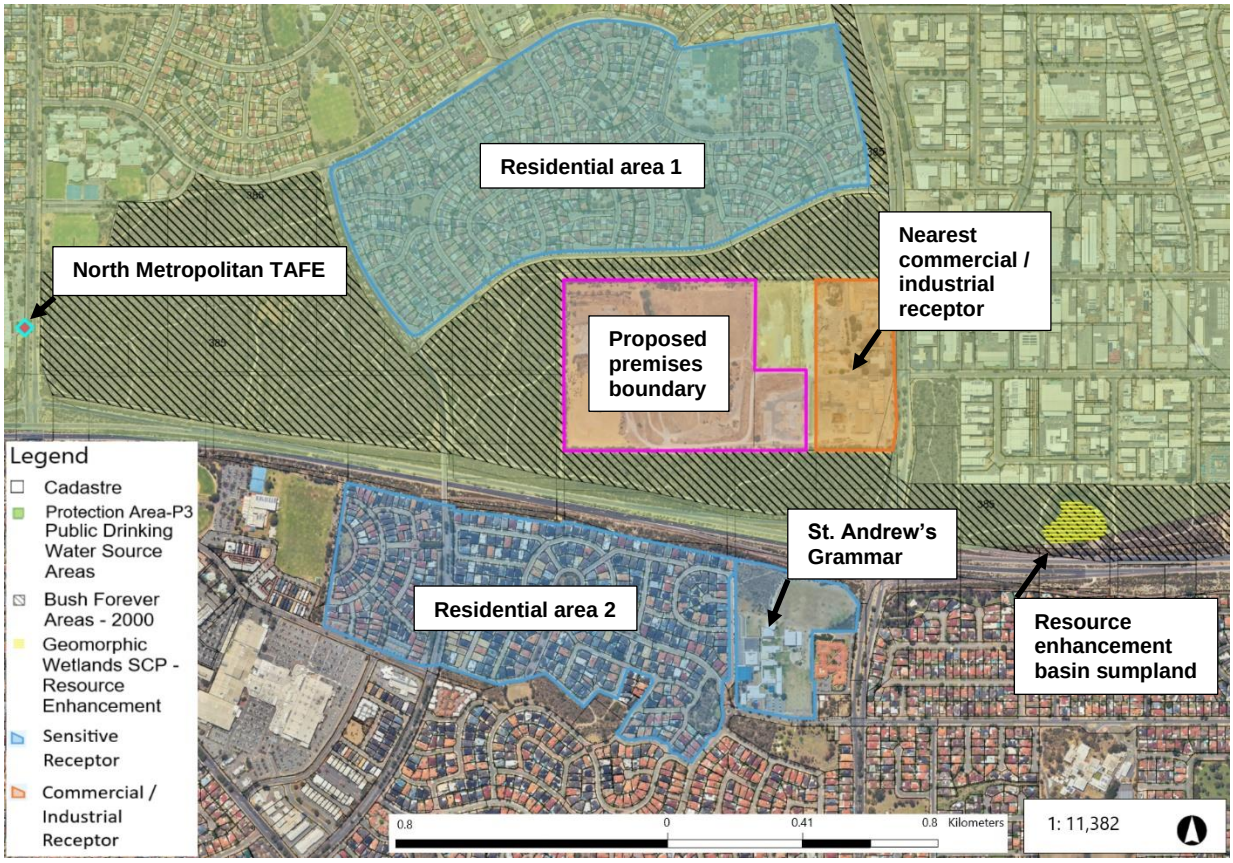


Figure 9: Potential receptors surrounding the Premises following the proposed amendment

7.1.3 Pathways

The proposed change to the Premises boundary will not result in any change to the potential pathways considered relevant to emissions and discharges from the prescribed premises. The pathways summarised in Table 3 (Section 4.2) are still considered relevant.

7.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020) for those existing emission sources and new receptors which will result from the proposed amendment and takes into account potential source-pathway and receptor linkages as identified in Section 7.1. Where linkages are in-complete they have generally not been considered further in the risk assessment. With the exception of landfill gas, potential emissions to existing receptors (Table 2) have not been reconsidered.

Where the Licence Holder 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 Licence Holder'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 Licence Holder's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 9.

The Revised Licence L6764/1997/14 that accompanies this Amendment Report authorises emissions associated with the existing operation of the Premises i.e. inert waste acceptance and landfilling activities. The conditions in the Revised Licence have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

Table 9: Risk assessment of potential emissions and discharges

Risk events Sources / activities	Potential emission	Potential pathways and impact	Receptors	Licence Holder controls and mitigations	Risk rating [1] C = consequence L = likelihood	Licence Holder's controls sufficient?	Conditions[2] of licence	Justification for additional regulatory controls
Historical municipal and inert waste landfill within the remaining Premises area	Landfill gas (including odour)	Vertical and lateral migration through soil Air / windborne pathway causing impacts to amenity and human health	Residential area 1 (nearest residential receptors) Mixed business use on proposed Lot 1 (nearest commercial /industrial receptors)	Refer to Section 7.1.1	C = Moderate L = Possible **Medium Risk**	N	**Condition 25**	The Delegated Officer has identified deficiencies in existing documentation relating to potential landfill gas emissions from the historical putrescible waste mass remaining within the proposed boundary of the Premises. The Delegated Officer is not aware of any landfill gas management plan that consolidates up-to-date information for the current infrastructure used to control landfill gas within the Lot 821 portion of the Premises. Additionally, there is no available monitoring information for landfill gas generation within the Lot 821 area and the potential migration of landfill gas to receptors surrounding the Premises. In the absence of further information for landfill gas emissions from Lot 821, the Delegated Officer considers that the risk event could occur at some time. Further information may result in the likelihood of this risk event being reduced. The management of landfill gas within areas retained within the Premises (primarily Lot 821) will be required to occur in accordance with existing licence conditions. Additionally, to address gaps in information, the Delegated Officer has specified a further condition to submit a management plan and risk assessment relating to landfill gas emissions from the waste mass remaining within the Premises area. As the closest sensitive receptor is the residential area located north of the premises, it may be suitable for landfill gas monitoring wells to initially target this area. If the risk associated with the lateral migration of landfill gas can be demonstrated as low, this may be considered an indicator that gas monitoring bores targeting the west and south perimeters are not required. In relation to the new commercial/industrial receptor resulting from the proposed amendment, the Delegated Officer considers that multiple regulatory controls exist through the *Contaminated Sites Act 2003* and *Planning and Development Act 2005* for the ongoing management of landfill gas risks to that receptor.
	Leachate	Infiltration through soil to groundwater causing impacts to beneficial use (non-potable)	Mixed business use on proposed Lot 1 (nearest commercial /industrial receptors)		C = Minor L = Rare **Low Risk**	Y	N/A	No additional regulatory controls are required. Groundwater is considered generally suitable for non-potable use. Multiple regulatory controls exist through the *Contaminated Sites Act 2003* and *Planning and Development Act 2005* that will result in removal of the source (historical landfill) from the proposed Lot 1 area. Following remediation, Lot 1 will be located up and cross-gradient of the source area to the west and the risk event may only occur in exceptional circumstances such as where the overextraction of groundwater occurs on Lot 1 (thereby potentially creating a cone of depression and drawing groundwater flow from the remaining prescribed premises onto Lot 1).
Acceptance of inert waste and disposal via landfilling	Noise	Air / windborne pathway causing impacts to amenity	Mixed business use on proposed Lot 1 (nearest commercial /industrial receptors)	Refer to Section 7.1.1	C = Minor L = Unlikely **Medium Risk**	Y	N/A	No additional regulatory controls are required. The Environmental Protection (Noise) Regulations 1997 apply.
	Odour				C = Minor L = Rare **Low Risk**	Y	N/A	No additional regulatory controls are required. Existing licence conditions related to waste acceptance are considered sufficient.
	Windblown waste				C = Minor L = Unlikely **Medium Risk**	Y	N/A	No additional regulatory controls are required. Existing licence conditions related to waste acceptance are considered sufficient.

Risk events					Risk rating [1] C = consequence L = likelihood	Licence Holder's controls sufficient?	Conditions[2] of licence	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Licence Holder controls and mitigations**				
	Dust	Air / windborne pathway causing impacts to amenity and human health			C = Minor L = Unlikely **Medium Risk**	Y	N/A	No additional regulatory controls are required. Existing licence conditions related to waste processing and landfill compaction are considered sufficient.
	Asbestos	Air / windborne pathway causing impacts to human health			C = Major L = Rare **Medium Risk**	Y	N/A	No additional regulatory controls are required. Existing licence conditions relating to waste acceptance, processing, cover and asbestos management are considered sufficient. The Premises does not accept any form of asbestos waste.
	Leachate	Infiltration through soil to groundwater causing impacts to beneficial use (non-potable)			C = Minor L = Rare **Low Risk**	Y	N/A	No additional regulatory controls are required. Existing licence conditions relating to waste acceptance and groundwater separation are considered sufficient. Inert waste has a low potential to produce leachate containing contaminants and the receptor will be located up and cross-gradient of the inert landfill area.
Abnormal operations (fire event)	Smoke and particulates	Air / windborne pathway causing impacts to amenity and human health		Refer to Section 7.1.1	C = Major L = Rare **Medium Risk**	Y	N/A	No additional regulatory controls are required. Existing licence conditions relating to waste acceptance and site security are considered sufficient.

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

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

8. Consultation

Table 10 provides a summary of the consultation undertaken by the department.

Table 10: Consultation

Consultation method	Comments received	Department response
Application advertised on the department's website on 14 April 2022	None received	N/A
Application advertised in the West Australian newspaper on 18 April 2022	None received	N/A
Local Government Authority advised of proposal on 12 April 2022	None received	N/A
Department of Planning, Lands and Heritage (DPLH) advised of proposal on 12 April 2022	DPLH replied on 4 May 2022 advising that it has no objection to the proposed exclusion of a portion of Lot 820 Alexander Drive from L6764/1997/14 to facilitate remediation. DPLH further advised it has no objection to the identification of the western portion of Lot 821 as "Landfill Area," and is supportive of the stated intention to continue accepting inert waste. These comments are provided on the understanding that landfill on Lot 821 will remain consistent with the terms of the Land Transfer Deed made between Atlas Brick Pty Ltd, the Western Australian Planning Commission and the Minister for Planning on 14 November 2012.	Noted.

Consultation method	Comments received	Department response
Department of Health (DoH) advised of proposal on 12 April 2022	DoH replied on 20 May 2022 advising that it is uncertain about the implications of this amendment on the management of ground gas emissions into the new development site at Lot 820, Alexander Drive. DOH has advised that the development is dependent on ground gas flows from Lot 820 being managed into the future and recommended that this is the responsibility of the existing licence holder. DoH recommends that DWER ensure that agreed ground-gas management continues into the future and is not affected by the change in licence.	The Delegated Officer notes the concerns regarding the management of landfill gas. Information within the various reports and investigations submitted under the CS Act have been considered and the Delegated Officer has sought internal advice from the department's Contaminated Sites Branch. It is understood that an Ongoing Site Management Plan relating to landfill gas and maintenance of mitigation measures will be required in perpetuity for the areas proposed for removal from the existing Premises boundary, with responsible parties being required to commit to the plan prior to site reclassification. From the information and advice provided, the Delegated Officer considers that the ongoing management of landfill gas risks to the proposed new development on Lot 820 is more appropriately managed under the mechanisms of the CS Act, rather than through the licence. This is due to the historical nature of the activity and the ability for ongoing management to occur through restrictions on use linked to certificates of title. The management of landfill gas within areas retained within the Premises (primarily Lot 821) will be required to occur in accordance with existing licence conditions. Additionally, to address gaps in information, the Delegated Officer has specified a further condition to submit a management plan and risk assessment relating to landfill gas emissions from the waste mass remaining within the Premises area.

Consultation method	Comments received	Department response
Licence Holder was provided with draft documents on 5 July 2022	The Licence Holder provided the following comments on the draft risk assessment and amended licence on 12 September 2022: Response 1 - Table 2 Infrastructure and Equipment With respect to the 'Landfill Area – Operational Requirement - Clause (b)', we consider this condition is related to any future cells and will accept the condition on the basis that it is not applied to the landfill cells that are currently closed. If this is not DWER intention, then the condition would not be acceptable. Response 2 - Table 2 Infrastructure and Equipment With respect to the 'Landfill Gas system – Operational Requirement – Clause (a)', we request this clause to be amended to 'A system for capturing landfill gas generated on the premises must be operated and maintained to minimise lateral migration of landfill gas outside of the boundary of the premises'. We consider this is appropriate for an historic landfill and is relevant for the underlying intent of this clause to mitigate risk to the residential premises to the north of the site. Response 3 - Table 2 Infrastructure and Equipment With respect to the 'Landfill Gas system – Operational Requirement – Clause (b)', we request this clause to be amended to 'The landfill gas extraction wells must collect and either flare or reuse landfill gas, or otherwise appropriately manage, on a continuous basis'. The amended wording reflects the potential change in management options for landfill gas that may be required during the period of the licence. Response 4 Discussions between Emerge and the assessing officer during the referral period have determined the intent of Table 9 Specified Actions, Clause (a)-(v) for the perimeter monitoring wells, Clause (c) and Clause (d) is to enable an assessment of the potential risk to residential premises that are located to the north of the site. The elements of Table 9 are therefore intended to focus along the northern boundary of the site. This should be included in the assessment to provide clarity.	The Landfill Area and corresponding operational requirements listed in Table 2 are intended to apply to the current and future landfill cells, not the already closed cells. The area to which the requirements apply is the Landfill Area depicted as 'LA' and purple cross-hatching in Schedule 1 (Figure 1) of the Revised Licence. In consideration of the premises' soil type and the landfill not having an engineered liner, the Delegated Officer notes that some lateral migration of landfill gas will occur and cannot be entirely prevented. Based on site conditions, the proposed wording change is considered appropriate. The intent of the requirement is still maintained, in that a system for managing landfill gas emissions is in place. The proposed wording change is considered appropriate given the age of the landfill and decreasing volumes of landfill gas being generated. It is understood that volumes of landfill gas being collected in some wells may soon reach the point where quantities are insufficient for flaring. Additional reasoning has been added to the risk assessment table discussing the location of landfill gas monitoring wells and the closest sensitive receptor, located north of the premises.

9. Conclusion

Based on the assessment in this Amendment Report, the Delegated Officer has determined that a Revised Licence will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

The Delegated Officer considers that there are more appropriate regulatory mechanisms existing outside of Part V of the EP Act for managing potential risks to the environment and public health, resulting from the area proposed to be removed from the Premises. These are provided through the *Contaminated Sites Act 2003* and the Contaminated Sites Regulations 2006, with their links to approvals under the *Planning and Development Act 2005* and the placement of memorials on certificate of titles. In reaching this decision the Delegated Officer has considered the following:

- The Premises has already been classified as *possibly contaminated - investigation required* under the CS Act and a memorial is present on the Lot 820 and Lot 821 Certificate of Title;
- The Licence Holder no longer performs activities on the area to be removed from the prescribed premises boundary that would fit the description of any prescribed premises listed in Schedule 1 of the EP Regulations;
- Putrescible waste landfilling on Lot 820 was concluded approximately 33 years ago and the putrescible landfill material on Lot 820 is likely to be substantially degraded, as evidenced through intrusive investigations (Douglas Partners 2021 and Emerge 2022a);
- Landfill gas generation rates have been determined as low, due to the age of the waste mass (Emerge 2022a and EPG 2022). Risks relating to landfill gas are proposed to be managed through remediation and monitoring under the CS Act;
- WAPC sub-division approval No. 161459 is conditional on the successful remediation of contamination from Lot 820. Through advice provided by DWER's Contaminated Sites Branch, similar conditions are expected on any development approvals yet to be granted;
- A requirement for a Mandatory Auditor has been triggered, which provides a high level of oversight for investigations, remediation and ongoing management of the removed area; and
- Advice has been received from DWER's Contaminated Sites Branch that the area can be appropriately managed under the CS Act and there were no objections to the proposed amendment.

Additional to the amendment proposed by the Licence Holder, the Delegated Officer has resolved to remove Category 62 and the authorisations for the acceptance of putrescible waste. The waste sorting facility that was decommissioned and removed in 2020 was the method of operation for the receipt, handling and temporary storage of putrescible waste, as well as the primary control for emissions and discharges from that waste. As this infrastructure has been removed, the Premises no longer fits the description of a Category 62 prescribed premises and appropriate controls for the acceptance of putrescible waste are not in place.

9.1 Summary of amendments

9.1.1 Application amendments

Table 11 provides a summary of the proposed amendments and will act as record of implemented changes. All proposed changes have been incorporated into the Revised Licence as part of the amendment process.

Table 11: Summary of licence amendments

<table>
<tr><th>Condition no.</th><th>Proposed amendments</th></tr>
<tr><td>Prescribed premises categories</td><td>The following was removed from the prescribed premises category table on the cover page:

Category 62: Solid waste depot with an assessed production or design capacity of 90,000 tonnes per annual period

The Licence Holder no longer carries out the activities and the related infrastructure and equipment for the activity is longer present on the premises.</td></tr>
<tr><td><u>Existing:</u>
1.3.1 – Table 1.3.1

<u>Revised:</u>
1 – Table 1</td><td>Putrescible waste and associated requirements were removed from the waste acceptance table.

The Licence Holder no longer accepts putrescible waste and the infrastructure and equipment for processing the waste is no longer present onsite.</td></tr>
<tr><td><u>Existing:</u>
N/A

<u>Revised:</u>
3 – Table 2</td><td>In accordance with the current licencing format, a condition and table relating to infrastructure and equipment used for processing waste or controlling and monitoring emissions and discharges was added. The condition reads as follows:

The licence holder must ensure that the site infrastructure and equipment listed in Table 4 and located at the corresponding infrastructure location is maintained and operated in accordance with the corresponding operational requirement set out in Table 4.

The associated table is structured as follows and has the following requirements:

<table>
<tr><th>Site infrastructure and equipment</th><th>Operational requirement</th><th>Infrastructure location</th></tr>
<tr><td>Inert Landfill Cell</td><td>(a) The separation distance between the base of the landfill and the highest groundwater level must not be less than 2 m; and
(b) Rehabilitation of a cell or phase must take place within 6 months after disposal in that cell or phase has been completed.</td><td>Landfill Area (LA), as depicted in Schedule 1: Figure 1</td></tr>
<tr><td>Landfill Gas System</td><td>(a) A system for controlling landfill gas generated on the premises must be operated and maintained to minimise lateral migration of landfill gas outside the boundary of the premises; and
(b) The landfill gas extraction wells must collect and either flare or reuse landfill gas, or otherwise appropriately manage, on a continuous basis.</td><td>N/A</td></tr>
<tr><td>Fencing and security gates</td><td>(a) Suitable fencing must be erected and maintained to prevent unauthorised access to the premises;
(b) Entrance gates to the premises must be securely locked when the premises is unattended; and
(c) Weekly inspections of all security measures must be undertaken and any damage must be repaired within five working days of its discovery.</td><td>N/A</td></tr>
<tr><td>Groundwater monitoring bores
(BH2S, BH2D, MW1-1, MW1-5, BH9, BH12, MW1-7, MW1-8 and MW1-9)</td><td>(a) Must be maintained free from blockages and in good working order to allow representative groundwater samples to be taken.</td><td>As depicted in Schedule 1: Figure 2</td></tr>
</table>

The condition and table also replace some conditions as discussed in the consolidation section below (Table 12).</td></tr>
</table>

Condition no.	Proposed amendments
Existing: 1.3.3 – Table 1.3.2 Revised: 4 – Table 3	Putrescible waste and associated requirements were removed from the waste processing table. The Licence Holder no longer accepts putrescible waste and the infrastructure and equipment for processing the waste is no longer present onsite.
Existing: 1.3.12 Revised: N/A	The condition relating to operation of the odour control system at the waste sorting facility has been removed. The Licence Holder has decommissioned and removed the infrastructure and equipment which relate to this condition.
Existing: N/A Revised: 8	The following standard condition relating to storage of material used for the recovery of spills was added: *The licence holder must ensure that all material used for the recovery, removal, and/or disposal of environmentally hazardous materials is stored in an impermeable container prior to disposal at an appropriately authorised facility.* The condition is the follow up requirement to condition 7 (existing condition 1.2.2) of the Revised Licence.
Existing: 2.1.2 Revised: 13	The condition relating to six monthly monitoring was amended to the following: *The licence holder must ensure that monitoring is undertaken in each annual period such that there are at least 9 months in between the days on which samples are taken in successive years.* The condition was changed as the six monthly period listed in the condition was no longer relevant. Groundwater monitoring now occurs annually since the amendments made through Amendment Notice 2. Changes to this condition were mistakenly omitted from Amendment Notice 2.
Existing: 2.3.1 – Table 2.3.1 Revised: 15 – Table 5	Footnote 2 which related to groundwater monitoring during 2019 was deleted and replaced with the following: *In-field non-NATA accredited analysis permitted.* The footnote was listed against pH and standing water level within the monitoring table (Table 6).
Existing: 2.2.1 – Table 2.2.1 Revised: 17 – Table 6	Putrescible waste was removed from the monitoring of inputs and outputs table. The Licence Holder no longer accepts putrescible waste and the infrastructure and equipment for processing the waste is no longer present onsite.

<table>
<tr><th>Condition no.</th><th>Proposed amendments</th></tr>
<tr><td><u>Existing</u>:
3.2.1 – Table 3.2.1 and 3.2.2

<u>Revised</u>:
21 – Table 8</td><td>Additional requirements were added for the reporting of groundwater monitoring within the Annual Environmental Report. The additions align the reporting with current departmental expectations for groundwater reporting.

<table>
<tr><th>Condition</th><th>Requirement</th></tr>
<tr><td>15</td><td>Monitoring of ambient groundwater quality, including:

(a) a tabulated summary of results, as well as all raw data provided in an accompanying Microsoft Excel spreadsheet digital document/file (or a compatible equivalent digital document/file), with all results being clearly referenced to laboratory certificates of analysis;

(b) a diagram with aerial image overlay showing all monitoring locations and depicting groundwater level contours, flow direction and hydraulic gradient;

(c) an interpretive summary and assessment of the results against previous monitoring results;

(d) an interpretive summary and assessment of the results against:

(i) a potassium chloride ratio of 0.3 (greater than this ratio indicates potential presence of landfill leachate);

(ii) premises specific criteria of 2 mg/L for TRH and 0.26 mg/L for naphthalene in offsite groundwater monitoring bores;

(iii) nominal criteria of 300 mg/L for ammonia and 10 mg/L for iron, to identify any decline in existing groundwater quality;

(iv) non-potable use guidelines for arsenic (0.1 mg/L) and manganese (5 mg/L);

(v) where a parameter does not have a specific criteria referred to in i – iv above, the relevant assessment levels for water as published in the Guideline Assessment and management of contaminated sites; and

(e) trend graphs to provide a graphical representation of historical results and to support the interpretive summary.</td></tr>
</table>

Requirements (c) and (d)(i-iv) replace existing condition 3.2.2, as discussed in the consolidation section below (Table 12).</td></tr>
</table>

<table>
<tr><th>Condition no.</th><th>Proposed amendments</th></tr>
<tr><td><u>Existing:</u>
N/A

<u>Revised:</u>
25</td><td>To address information gaps relating to the management and potential risk of landfill gas generated from the putrescible waste mass remaining within the Premises, the following condition has been added to the Revised Licence:

The licence holder must submit to the CEO the information in Table 9 in accordance with the requirements and timescale outlined in Table 9.

Table 9: Specified actions
<table><tr><th>Information</th><th>Requirements</th><th>Timescale</th></tr><tr><td>Landfill Gas Management Plan and Risk Assessment</td><td>A consolidated management plan and risk assessment including but not limited to:
(a) A detailed description of the landfill gas management system, monitoring, and maintenance procedures, including details on:
(i) current and projected gas generation rates across the historical putrescible landfill within the premises;
(ii) the collection system (active or passive) and layout of landfill gas piping and extraction wells (vertical or horizontal or both);
(iii) utilisation of captured gas (e.g. flaring, treatment, and reuse in a system of a combustion);
(iv) specifications of combustion engines/flares and likely emissions;
(v) in-waste gas monitoring points, perimeter monitoring bores and associated monitoring program; and
(vi) contingency plans in the event of breakdown of various components.
(b) Design drawings and layout figures of the landfill gas management system including:
(i) in-cell layout of gas collection infrastructure (aerial and cross-section diagrams should be provided where relevant);
(ii) overview of associated above-ground gas management infrastructure; and
(iii) landfill gas monitoring locations.
(c) An assessment of potential risks of lateral landfill gas migration and emissions to residential receptors located north of the premises; and
(d) A conceptual site model which clearly identifies all potential source-pathway-receptor (S-P-R) linkages for landfill gas.</td><td>15 September 2023</td></tr></table></td></tr>
<tr><td><u>Existing:</u>
Schedule 1 Premises map

<u>Revised:</u>
Schedule 1 Premises map Figure 1</td><td>The premises map was replaced with a figure showing the updated boundary of the premises and the landfill area.</td></tr>
<tr><td><u>Existing:</u>
Schedule 1 Sorting facility map

<u>Revised:</u>
N/A</td><td>The sorting facility map was removed from the licence.

The Licence Holder no longer carries out the activities and the sorting facility infrastructure is longer present on the Premises.</td></tr>
</table>

Condition no.	Proposed amendments
Existing: Schedule 1 Landfill area map Revised: Schedule 1 Premises map Figure 1	The Landfill Area map was removed from the licence, as the map is now redundant. The Landfill Area is already shown and defined on Figure 1.
Existing: Schedule 1 Map of monitoring locations Revised: Schedule 1 Map of monitoring locations Figure 2	The map of monitoring locations was updated to remove the previous premises boundary from the figure.

9.1.2 Consolidation and conversion

Table 12 provides a summary of the licence conditions consolidated and converted in this amendment and will act as record of implemented changes. All proposed changes have been incorporated into the Revised Licence as part of the amendment process.

Table 12: Consolidation of licence conditions in this amendment

Existing condition	Condition summary	Revised licence condition	Conversion notes
N/A	Expiry Date: 09 July 2017	Expiry Date: 09 July 2032	In accordance with the Notice of Amendment of Licence Expiry Dates (29/04/2016) and revised to current licensing format.
	Premises address: Lot 1 on Diagram 36381	Premises details: Lots 820 and 821 on Deposited Plan 404602	In accordance with Amendment Notice 2 and revised to current licensing format.
	Premises address: as depicted in Schedule 1	Premises details: As defined by Figure 1 in Schedule 1 and coordinates in Schedule 2	
1.1.1 1.1.2	Interpretation and definitions	N/A Interpretation section, Definitions and Table 9	Redundant conditions. Revised to current licensing format. Redundant definitions were removed.
1.1.3	Australian or other standard		
1.1.4	Reference to code of practice		
1.1.5	Emissions	N/A	Redundant condition. Revised to current licensing format.
1.2.1	Pollution control and monitoring equipment	3	Revised to be covered by alternative existing conditions. Condition 3 relates to specified equipment and Condition 14 relates to monitoring equipment.
		14	

Existing condition	Condition summary	Revised licence condition	Conversion notes
1.2.2	Recovery and removal of spills	7	Revised to current licensing format.
1.2.3	Prevention of contaminated stormwater	9	Revised to current licensing format.
1.3.1 Table 1.3.1	Waste acceptance	1 Table 1	Revised to current licensing format.
1.3.2	Quarantine and removal of non-conforming waste	2	Revised to current licensing terminology. Ambiguity within the former licence has also been removed relating to the need to remove non-conforming waste off-site in a timely manner; the new requirement is to do so within seven days of receipt.
1.3.3 Table 1.3.2	Waste processing	4 Table 3	Revised to current licensing format. Groundwater separation process limit was moved to the infrastructure and equipment table [Condition 3 - Table 2: Inert Landfill Cell (a)].
1.3.4 Table 1.3.3	Cover requirements	6 Table 4	Revised to current licensing format. *As soon as practicable* terminology removed from timescales.
1.3.5(a) 1.3.5(b)	Landfill management	4 Table 3 [Inert Waste Type 1 and 2 (b), (c)]	Requirements related to processing waste. Moved to waste processing table and revised to current licensing terminology. *As soon as practicable* terminology removed.
1.3.5(c)		3 Table 2 [Inert Landfill Cell (b)]	Requirement relates to the landfill infrastructure. Moved to infrastructure and equipment table and revised to current licensing terminology. The Inert Landfill Cell is listed in the infrastructure and equipment table added via updating to the current licensing format.
1.3.6	Site security	3 Table 2 [Fencing and security gates]	Requirements relate to infrastructure. Moved to infrastructure and equipment table and revised to current licensing terminology. Fencing and security gates is listed in the infrastructure and equipment table added via updating to the current licensing format.
1.3.7	Windblown waste	10	Revised to current licensing format. *As soon as practicable* terminology removed.
1.3.8	Pest and vermin control	11	Revised to current licensing terminology.

Existing condition	Condition summary	Revised licence condition	Conversion notes
1.3.9	Landfill gas extraction wells	3 Table 2 [Landfill Gas System (b)]	Requirement relates to gas extraction infrastructure/equipment. Moved to infrastructure and equipment table and revised to current licensing terminology. The Landfill Gas System is listed in the infrastructure and equipment table added via updating to the current licensing format.
1.3.10	Daily inspection for landfill gas	12(a)	Merged and revised to current licensing terminology.
1.3.11	Control identified landfill gas	12(b)	
1.3.13	Operate in accordance with Asbestos Management Plan, September 2014	5	Revised to current licensing terminology.
2.1.1(a)	Water sample collection and preservation under AS/NZS 5667.1	15 Table 5	Redundant condition. AS/NZS 5667.1 is listed in the method column due to the current format of the monitoring table.
2.1.1(b)	Groundwater sampling under AS/NZS 5667.11	15 Table 5	Redundant condition. AS/NZS 5667.11 is listed in the method column due to the current format of the monitoring table.
2.1.1(c)	NATA accreditation	16	Revised to current licensing format.
2.1.1(d)	Analysis in accordance with the National Environmental Protection (Assessment of Site Contamination) Measure 1999	N/A	Redundant condition. Removed from licence.
2.1.3	Monitoring equipment calibration	14	Revised to current licensing format.
2.1.4	Report on monitoring calibration discrepancies	N/A	Redundant condition. Removed from licence.
2.2.1 Table 2.2.1	Monitoring inputs and outputs	17 Table 6	Revised to current licensing format.
2.3.1 Table 2.3.1	Groundwater monitoring	15 Table 5	Revised to current licensing format and consolidation of changes made through Amendment Notice 2.
2.4.1 Table 2.4.1	Meteorological monitoring	18 Table 7	Revised to current licensing format.
3.1.1	Requirements for information and records	22 and 23	Revised to current licensing format.

Existing condition	Condition summary	Revised licence condition	Conversion notes
3.1.2	Informing employees of licence conditions	N/A	Redundant condition. Removed from licence.
3.1.3	Annual Audit Compliance Report	20	Revised to current licensing format and actual submission date listed.
3.1.4	Complaints management	19	Revised to current licensing format.
3.2.1 Table 3.2.1	Annual Environmental Report submission	21 Table 8	Revised to current licensing format and groundwater reporting requirements. Actual submission date listed.
3.2.2	Additional Annual Environmental Report requirements	Table 8	Revised to current licensing format.
3.2.3 Table 3.2.2	Non-annual reports	N/A	Redundant condition. Removed from licence. Already required by s95 of the EP Act.
3.3.1 Table 3.3.1	CEO notifications	N/A and 24	Partly redundant condition. Limit breach and calibration report notifications are no longer required and were removed. Notification of unusable groundwater bores revised to a standalone condition (24) using current licensing terminology. The removal of notification requirements does not negate the requirement to comply with s72 of the EP Act.
Schedule 1: Maps	Landfill Area Map	Schedule 1: Figure 3	Existing figure retained with new naming convention.
	Map of monitoring locations	Schedule 1: Figure 4	New naming convention and consolidation of changes made through Amendment Notice 2.
Schedule 2 Reporting & notifications	Annual Audit Compliance Report Form N1 Notification	N/A	Redundant attachment. Deleted from Licence Forms accessed at www.dwer.wa.gov.au

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2. Construction Industry Research and Information Associated (CIRIA) 2007, *Report C665: Assessing risks posed by hazardous ground gases to buildings*, London, United Kingdom.
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. DWER 2021, *Guideline: Assessment and Management of Contaminated Sites*, Perth, Western Australia.
6. Douglas Partners (Douglas) 2021, *Due Diligence Environmental Investigation: Proposed Mixed Business Use Development Lot 820 Alexander Drive, Mirrabooka, WA*, unpublished report prepared for Atlas Group Pty Ltd. (*DWER reference: DWERDT548179*)
7. DWER 2020, *Guideline: Risk Assessments*, Perth, Western Australia.
8. Emerge Associates (Emerge) 2022a, *Targeted Detailed Site Investigation: 501 Alexander Drive, Mirrabooka*, unpublished report prepared for Hesperia Property Pty Ltd. (*DWER reference: DWERDT584075*)
9. Emerge 2022b, *Remediation Action Plan - Landfill Remediation: 501 Alexander Drive, Mirrabooka*, unpublished report prepared for Hesperia Property Pty Ltd. (*DWER reference: DWERDT584073*)
10. Environmental Risk Sciences Pty Ltd (EnRiskS) 2022, *Human Health Risk Assessment: Proposed Lot 1, 501 Alexander Drive, Mirrabooka WA*, unpublished report prepared for Hesperia Property Pty Ltd. (*DWER reference: DWERDT584061*)
11. New South Wales Environmental Protection Authority (NSW EPA) 2020, *Assessment and management of hazardous ground gases: Contaminated Land Guidelines*, Parramatta, New South Wales.
12. The Environmental Protection Group Pty Ltd (EPG) 2022, *Landfill Gas Risk Assessment and Gas Remediation Strategy: Lot 1, 501 Alexander Drive, Mirrabooka WA*, unpublished report prepared for Hesperia Property Pty Ltd. (*DWER reference: DWERDT584062*)

Appendix 1: Application validation summary

SECTION 1: APPLICATION SUMMARY					
Application type					
Works approval	☐				
Licence	☐	Relevant works approval number:		None	☐
		Has the works approval been complied with?		Yes ☐ No ☐	
		Has time limited operations under the works approval demonstrated acceptable operations?		Yes ☐ No ☐ N/A ☐	
		Environmental Compliance Report / Critical Containment Infrastructure Report submitted?		Yes ☐ No ☐	
		Date Report received:			
Renewal	☐	Current licence number:			
Amendment to works approval	☐	Current works approval number:			
Amendment to licence	☒	Current licence number:	L6764/1997/14		
		Relevant works approval number:		N/A	☐
Registration	☐	Current works approval number:		None	☐
Date application received		22 March 2022			
Applicant and Premises details					
Applicant name/s (full legal name/s)		Atlas Group Pty Ltd			
Premises name		Atlas Group Pty Ltd			
Premises location		501 Alexander Drive, MIRRABOOKA, WA 6061 Lot 820 and 821 on Deposited Plan 404602			
Local Government Authority		City of Stirling			
Application documents					
HPCM file reference number:		DWERDT580321 – application form DWERDT580317 – supporting documents			
Key application documents (additional to application form):		Cover letter Boundary and site plan figures Landfill Closure Review – Lot 820 Alexander Drive, Mirrabooka ASIC Extract Certificates of Title The Landfill Closure Review also references documents already submitted to Contaminated Sites. These documents have been located and saved in the licence folder. The documents are: – Mandatory Auditor's Report (March 2022) – Targeted Detailed Site Investigation (February 2022) – Human Health Risk Assessment (February 2022) – Landfill Gas Risk Assessment and Gas Remediation Strategy (February 2022)			

	– Remediation Action Plan (February 2022) – Memo Summary of Encountered Ground Conditions (February 2022) – Memo Summary of Gas Mitigation Concept (December 2021) – Environmental Due Diligence Investigation (November 2021) – Geotechnical Due Diligence Investigation (February 2020) – Mandatory Auditor's Report (January 2014)
Scope of application/assessment	
Summary of proposed activities or changes to existing operations.	**<u>Licence amendment</u>** Proposal to remove the majority of Lot 820 (approx. ¾) from the boundary of the prescribed premises to facilitate remediation and ongoing site management under the *Contaminated Sites Act*. Lot 820 comprises an area of historical putrescible waste landfilling at the premises. Landfilling commenced in the eastern most portion of the lot and progressed westward, prior to cessation and capping in 1997. This section of landfill has been closed for approximately 25 years. Detailed investigations and assessments required under the *Contaminated Sites Act* indicate the area is suitable for the existing industrial land-uses located above the historical waste mass. Remediation and redevelopment to a more sensitive sequential landuse is considered an achievable outcome. The only required change to the licence is the spatial description of the premises and associated boundary mapping. No other conditions appear to need changing.

Category number/s (activities that cause the premises to become prescribed premises)

Table 1: Prescribed premises categories

Prescribed premises category and description	Assessed production or design capacity	Proposed changes to the production or design capacity (amendments only)
Category 62: solid waste depot	70,000 tonnes per annual period	No change
Category 63: Class I inert landfill site	250,000 tonnes per annual period	No change

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 ☐ No ☒	Referral decision No: Managed under Part V ☐ Assessed under Part IV ☐
Does the applicant hold any existing Part IV Ministerial Statements relevant to the application?	Yes ☐ No ☒	Ministerial statement No: EPA Report No:
Has the proposal been referred and/or assessed under the EPBC Act?	Yes ☐ No ☒	Reference No:
Has the applicant demonstrated occupancy (proof of occupier status)?	Yes ☒ No ☐	Certificate of title ☒ General lease ☐ Expiry: Mining lease / tenement ☐ Expiry: Other evidence ☐ Expiry:

Has the applicant obtained all relevant planning approvals?	Yes ☐ No ☐ N/A ☒	If N/A explain why? The sand extraction operation at the premises pre-dates the Metropolitan Regional Scheme. Correspondence from WAPC states the following: *The pre-existent sand mining and brickworks were recognised under clause 38 of the MRS as a non-conforming use. These and some other associated uses therefore have timeless planning approvals, having preceded the introduction of the MRS.*
Has the applicant applied for, or have an existing EP Act clearing permit in relation to this proposal?	Yes ☐ No ☒	CPS No: N/A No clearing is proposed.
Has the applicant applied for, or have an existing CAWS Act clearing licence in relation to this proposal?	Yes ☐ No ☒	Application reference No: N/A Licence/permit No: N/A No clearing is proposed.
Has the applicant applied for, or have an existing RIWI Act licence or permit in relation to this proposal?	Yes ☐ No ☒	Application reference No: Licence/permit No: Licence / permit not required.
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the EP Act)?	Yes ☐ No ☒	Name: N/A Type: N/A Has Regulatory Services (Water) been consulted? Yes ☐ No ☐ N/A ☒ Regional office: Swan Avon
Is the Premises situated in a Public Drinking Water Source Area (PDWSA)?	Yes ☒ No ☐	Name: West Mirrabooka Underground Water Pollution Control Area Priority: P3 Are the proposed activities/ landuse compatible with the PDWSA (refer to WQPN 25)? Yes ☐ With conditions ☒ No ☐ N/A ☐ Class I landfill is compatible with a P3 area when meeting conditions 6, 13, 22, 24, 26, and 28 and WQPN 25. Screening of raw material is compatible with a P3 area when meeting conditions 9, 12, 13, 14, 19, 22, 24, 26, 28, 41 and located

		outside of a protection zone.
Is the Premises subject to any other Acts or subsidiary regulations (e.g. *Dangerous Goods Safety Act 2004, Environmental Protection (Controlled Waste) Regulations 2004, State Agreement Act xxxx*)	Yes ☒ No ☐	*Environmental Protection (Controlled Waste) Regulations 2004*
Is the Premises within an Environmental Protection Policy (EPP) Area?	Yes ☐ No ☒	
Is the Premises subject to any EPP requirements?	Yes ☐ No ☒	
Is the Premises a known or suspected contaminated site under the *Contaminated Sites Act 2003*?	Yes ☒ No ☐	Classification: possibly contaminated – investigation required (PC–IR) Date of classification: 25 February 2014 The classification was based on several soil and groundwater investigations undertaken at the site. The investigations found buried landfill materials associated with historic and current land use activities and total dissolved solids (salts), ammonia, chloride, iron, phosphorus and degraded hydrocarbons (such as from petrol, diesel and/or oil) present in groundwater beneath the site. TRIM – Current: 2011/010585-9 Previous: DEC10015/1 and 2011/010585-1 to 8

Direct interest stakeholders			
City of Stirling	Letter to be sent	Yes ☒	No ☐
Western Australian Planning Commission	Letter to be sent	Yes ☒	No ☐
Department of Health	Letter to be sent	Yes ☒	No ☐
Internal – Contaminated Sites Branch	Letter to be sent	Yes ☒	No ☐