ATTACHMENTS

DEVELOPMENT AND INFRASTRUCTURE SERVICES COMMITTEE MEETING

6.00pm

City of Albany Council Chambers

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City of Albany

Local Planning Scheme No. 2

Amendment No. 3

Summary of Amendment Details

Standard Amendment, Rezoning Land from 'Rural Smallholdings', 'Light Industry' and 'Local Road' to 'Urban Development' to Facilitate Precinct Structure Plan Operation

FORM 2A

Planning and Development Act 2005

RESOLUTION TO PREPARE AMENDMENT

TO LOCAL PLANNING SCHEME

City of Albany Local Planning Scheme No. 2

Amendment No. 3

Resolved that the Local Government pursuant to section 75 of the *Planning and Development Act* 2005, amend the above Local Planning Scheme by:

1. **Rezone Lots 895 and 1209 Woolstores Place, Mount Melville, Lot 1104 on Deposited Plan 165964, Lots 1156 and 1157 on Deposited Plan 171141 from 'Light Industry' to 'Urban Development';**
2. **Rezone Lot 50 on Deposited Plan 426285, Lot 141 Woolstores Place, Mount Elphinstone, Lot 44 on Deposited Plan 171141 and Pin 583843 from 'Rural Smallholdings' to 'Urban Development';**
3. **Rezone a 3,787m^2 portion of Lot 530 on Deposited Plan 408474 and Lot 529 Deposited Plan 408473 from 'Local Road' (Woolstores Place) to 'Urban Development', as notated on the Scheme Map;**
4. **Rezone Lot 1350 on Deposited Plan 184224 from 'Drainage/Waterway' reserve to 'Urban Development';**
5. **Delete RU8 from Schedule 3, Table 10.**
6. **Add row 69 to Schedule 7, Table 17, as follows:**

No.	Description of Affected Lands	Standards
69	Lots 895 and 1209 Woolstores Place, Mount Melville Lot 141 Woolstores Place, Mount Elphinstone Lot 50 Woolstores Place, Mount Elphinstone Lot 1104 on Deposited Plan 165964 Lots 44, 1156 and 1157 on Deposited Plan 171141 Lot 1350 on Deposited Plan 184224 A portion of Lot 530 on Deposited Plan 408474 Lot 529 on Deposited Plan 408473 Lot 501 on Deposited Plan 409116 Pin 583843	1. All development shall be constructed with a minimum finished floor level height of 2.5m AHD.

7. **Delete Special Control Area 15 – Princess Royal Harbour Inundation Area from the amendment area, as specified within the Scheme Map.**

The amendment is standard under the provisions of the *Planning and Development (Local Planning Schemes) Regulations* 2015 for the following reason(s):

- **The Amendment is consistent with the City of Albany Local Planning Strategy.**

Dated this 22 day of October 2024

(Chief Executive Officer)

Andrew Turner Sharpe

EXECUTIVE SUMMARY

Rowe Group acts on behalf of Rural Logistics (WA) Pty Ltd ('Client'), the main landowner of the Woolstores Precinct. The Precinct comprises privately held lots and lots and road reserves owned by the Crown, State of Western Australia and/or vested with the City of Albany ('City') for its care and management ('subject land' or 'amendment area').

We have been instructed by our Client to request an amendment to the City of Albany *Local Planning Scheme No. 2* seeking to transfer the subject land from the 'Rural Smallholdings' and 'Light Industry' zone, and 'Local Road' reserve to the 'Urban Development' zone. The proposal ultimately seeks to facilitate the operation of the Albany Woolstores Precinct Structure Plan ('PSP' or 'structure plan') over the subject land.

The PSP was formally accepted by the City for assessment in August 2023, with public consultation concluding in October 2023. At its meeting in February 2024, the City's Council resolved to support the PSP and submit it to the DPLH for final assessment. The DPLH are currently considering the PSP and aims to have it finalised in the last half of the 2024 calendar year. The DPLH has advised that the proposed amendment should be initiated by Council, considered by the Environmental Protection Authority and approved by the Minister for Planning for the purpose of consultation prior, to the determination of the PSP. In this regard, this amendment request is being made in accordance with Section 75 of the *Planning and Development Act 2005* to facilitate subdivision and development over the subject land, as guided by the draft structure plan.

The purpose of this report is to provide the DPLH and the Western Australian Planning Commission ('WAPC') with the necessary information to support the proposed rezoning of the subject land and amendment to the scheme text. This report represents the accumulation of technical reporting from this scheme amendment request and the structure plan proposal.

As demonstrated in the balance of this report and the attached technical appendices, the proposed scheme amendment request represents a reasonable and appropriate planning outcome for the subject land for the following reasons:

- The proposed amendment is to facilitate the implementation of the Albany Woolstores PSP over the subject land and allow for the structure plan to be considered by the Western Australian Planning Commission;
- The proposed amendment is consistent with the regional and local strategic planning frameworks to facilitate a mixed use development with a tourism focus;
- The proposed scheme amendment request together with the PSP provides an opportunity for the existing zoning restrictions for the past use of the site, being 'Restricted Use 8', and the broader area, being 'Special Control Area 15 – Princess Royal Harbour Inundation Area', to be removed and allow for a more efficient and suitable use of the subject land based on the site specific circumstances and management regime outlined in the PSP; and
- The planning and development process will in time provide the trigger for the provisions of the structure plan to be normalised into the *City of Albany Local Planning Scheme No. 2* consistent with orderly and proper planning.

1.0 INTRODUCTION

Rowe Group acts on behalf of the main landowner within the Woolstores Precinct (Rural Logistics (WA) Pty Ltd). The Precinct comprises privately held lots and lots and road reserves owned by the Crown, State of Western Australia and/or vested with the City of Albany for its care and management ('subject land' or 'amendment area').

We have been instructed by the landowner to request an Amendment to the City of Albany *Local Planning Scheme No. 2*. The proposal seeks to transfer the subject land to the 'Urban Development' zone to facilitate the operation of a structure plan.

This request is being made in accordance with Section 75 of the *Planning and Development Act 2005* to facilitate development over the subject land, as guided by the draft Albany Woolstores Precinct Structure Plan ('PSP'). The PSP is currently under final assessment by the Department of Planning, Lands and Heritage ('DPLH').

The purpose of this report is to provide the DPLH and the Western Australian Planning Commission ('WAPC') with the necessary information to support the proposed rezoning of the subject land.

In preparing this report, we have engaged a project team of specialist consultants to provide technical input. The consultant team is listed in **Table 1** below.

Discipline	Consultant
Town Planning	Rowe Group
Environment	Strategen-JBS&G

Table 1: Project Team

2.0 SITE CONTEXT

LOCATION

The subject land is located in the municipality of the City of Albany ('City'), approximately 1.7 kilometres west of the Albany town centre and within the Great Southern Region of Western Australia. Albany is a regional city and is surrounded by key regional towns including Denmark, Mount Barker, Jerramungup, and Bremer Bay.

Refer **Figure 1 – Regional Location**.

The subject land is situated in suburbs of Mount Elphinstone and Mount Melville and is bound by the Albany Ring Road to the north and east, the southern railway line to the west, and the Princess Royal Harbour to the south.

The railway line is a key freight route between Albany and Northam, primarily for grain. The Albany Ring Road is an 11.5 kilometre freight route which extends south from Menang Drive and the Albany Highway intersection, running parallel to Link Road and connecting to Princess Royal Drive. This in turn provides access to the localities of Robinson, Torndirrup, Little Grove and beyond.

The surrounding land is characterised by rural smallholdings and residential to the west, industrial to the north and Mount Melville to the east.

Refer **Figure 2 – Local Context**.

SURROUNDING LAND USES

The subject land is generally bound by Princess Royal Drive which provides access to existing recreational and suburban residential development to the north and east of the amendment area.

Explain Albany Ring Road as this has replaced Frenchman Bay Road as a boundary to the north.

Frenchman Bay Road provides access to rural properties of various sizes and coastal land identified for future development via a structure plan.

Land to the north of the subject land is serviced by Lower Denmark Road (via Frenchman Bay Road) and Hanrahan Road (via Frenchman Bay Road and Princess Royal Drive) which provides access to large areas of land utilised for industrial development. The subject land is significantly isolated from the primary industrial area due to the existing and future road configuration north of the amendment area.

FIGURE 1
REGIONAL LOCATION

0 625 m
SCALE @ A4: 1:25,000

FIGURE 2
LOCAL CONTEXT

SITE AREA AND OWNERSHIP

The subject land comprises various lots and road reserves. The lots and road reserves that form the amendment area are summarised below in **Table 2** below.

Lot	Plan	Vol/Folio	Address	Area - ha	Landowner
895	DP161301	445/ 169A	34 Woolstores Place, Mount Melville	4.054	Rural Logistics (WA) Pty Ltd
1104	DP165964	445/ 169A	34 Woolstores Place, Mount Melville	2.001	Rural Logistics (WA) Pty Ltd
1209	DP173935	445/ 169A	34 Woolstores Place, Mount Melville	3.359	Rural Logistics (WA) Pty Ltd
1156	DP171141	480/62A	No Street Address Available	0.202	Rural Logistics Pty (WA) Ltd
1157	DP171141	123/109A	No Street Address Available	2.253	Rural Logistics (WA) Pty Ltd
530	DP408474	LR3172/668	Woolstores Place – road reserve	1.090	State of Western Australia
1350	DP184224	LR3009/754	No Street Address Available	0.432	State of Western Australia
44	DP171141	LR3008/848	No Street Address Available	0.303	State of Western Australia
PIN 583843	No details	No details	No street Address Available	0.110	Crown Land
402	DP413330	No Details	No Street Address Available	1.9202	State of Western Australia
141	DP027076	LR1133/829	23 Woolstores Places, Mount Elphinstone	0.2025	Rural Logistics (WA) Pty Ltd
50	DP426285	4054/644	No Street Address Available	1.988	Rural Logistics (WA) Pty Ltd
529	DP408473	LR3172/ 667	Woolstores Place – road reserve	0.3787	State of Western Australia
501	DP409116	LR3168/234	Road reserve	0.1934	State of Western Australia

Table 2: Land Ownership Table

Refer **Figure 3 – Site Plan**.

0 125 m

SCALE @ A4: 1:5000

FIGURE 3
SITE PLAN

SITE CONDITIONS

The following section provides a summary of the environmental site conditions of the subject land as outlined in the Environmental Assessment Report ('EAR') prepared by JBS&G in support of the structure plan. This EAR has since been updated to reflect the findings of an Ecological Assessment and Ecological Survey.

TYPOGRAPHY

The subject land is relatively flat to slightly undulating, with elevations ranging from 10 metres Australian Height Datum ('AHD') to 2 metres AHD toward the south. The elevation is steepest toward the northmost portion of the subject land.

GEOMORPHOLOGY AND SOILS

The subject land is located in the Albany-Fraser Orogen Nornalup Complex Range Formation, the geological unit of which the site is based comprises Mesoproterozoic granite and pegmatite. This geological unit is described by Geoscience Australia (2008) as follows:

- Mg 74405: Granite, metagranite, Equigranular to porphyritic granite; leucocratic granite; biotite granite with potassium feldspar phenocrysts in places; foliated adamellite; mixed granitic rocks; dioritic rocks.

The subject land is located within the Torbay soil systems, specifically within the Owingup soil subsystem. The Owingup subsystem is described by the Department of Primary Industries and Regional Development ('DPIRD') (2019) as follows:

- 42TbOW: Plains with swamps, lunettes, and dunes. Yellow solonetzic soils, organic loams, and diatomaceous earth; Wattle-Paperbark thickets, Teatree heath and reeds. Podzols on dunes; Banksia-Sheoak woodland.

The geomorphology and soil(s) that the subject land is comprised of contribute to the narrow, swampy coastal plain that makes up the southern portion of the Albany Sandplain hydrological zone. The soils are described by DPIRD (2019) as being relatively non-saline, pale-deep sands that generally support sedgelands and paperbark thickets.

Acid Sulfate Soils ('ASS') are naturally occurring, iron sulphide-rich soils, sediments, or organic substrates, formed under inundated/waterlogged conditions. when exposed to oxygen, these sulphides can oxidise and release sulfuric acid and heavy metals. This process can occur due to drainage, dewatering or excavation.

The ASS risk mapping available from the Australian Soil Resource Information System ('ASRIS') (2013) and the Department of Water and Environmental Regulation ('DWER') (2017). The land is classed as having a 'High Probability of Occurrence' (ASRIS 2013) and/or 'High to Moderate risk' (DWER 2017) of ASS occurring within 3 metres of the natural soil surface that could be disturbed by land development activities.

Accordingly, the Environmental Assessment Report ('EAR') completed by JBS&G recommends that should dewatering/soil draining or soil disturbance of more than 100 m^3 be anticipated during subdivision and development of the land, then an ASS investigation should be completed to assess the nature and extent of ASS at the site. Should ASS be identified, and its disturbance unavoidable during site construction/development, an ASS management plan should be prepared and implemented during the site development.

HYDROLOGY

Groundwater

Regional hydrological mapping indicates that the subject land is underlain by the Bremer West Superficial Aquifer. Groundwater quality in the broader area is fresh to saline, with approximate total dissolved solid concentrations being between 100 to 100,000 mg/L.

Given the subject land's proximity to the coast, groundwater levels range from approximately 7.5 metres below ground level ('mbgl') to less than 1 mbgl, with surface expressions of groundwater presenting themselves throughout the southern portion of the subject land. No groundwater licences currently exist within the subject land.

Surface Water

The subject land is situated within the Princess Royal Harbour hydrological catchment and sub-catchment of the Albany Coast Basin. There are no perennial waterways onsite; however, surface expressions of groundwater present themselves on a seasonal basis. No significant, Nationally Important (Directory) and/or Ramsar-listed wetlands are present within the subject land. Surface water drainage networks drain run through the land (from the north) via a main open channel into three catchments.

The subject land is not within a mapped 100 Year ARI Floodplain Area; however, given its proximity to the foreshore flat of the Royal Princess Harbour, it is subject to inundation. Early site sampling from the Hydrology Consultant has indicated that groundwater nutrient levels are elevated for the site, possibly contributed from surrounding and historical land uses.

CONTAMINATION

A list of contaminated sites from a search of the DWER contaminated sites database identified seven (7) registered contaminated sites within a 1 kilometre radius of the subject land, all listed as 'Remediated for Restricted Use'. The majority of the contamination issues with these sites are related to historical usage of:

- Lead products;
- Fertilisers;
- Acidic groundwater and pollutant transport; and
- Increased levels of iron, zinc, and copper in groundwater beyond environmental standards (ANZECC).

A Preliminary Site Investigation ('PSI') comprising a desktop assessment and field inspection has been undertaken by JBS&G to assess the nature of current and/or historical potentially contaminating activities that may have previously occurred within the subject land or on adjacent properties, which is intended to guide the requirement for a further site assessment (Detailed Site Investigation) at later stages of the subdivision implementation process.

Potential sources of contamination within the subject land that were identified in the PSI include, but may not be limited to, the following:

- The historical industrial land use(s) of the site;
- Asbestos contamination associated with the former site structures or illegal dumping/fly tipping activities (southeast portion of the subject land);
- Potential uncontrolled fill associated with the reclaimed land; and
- Potential migration of contaminated groundwater from up-gradient properties.

Based on the PSI conclusions, the following recommendations were made:

- Further assessment or management/remediation of the potentially impacted soils and groundwater should be considered to assess the potential risks to future site receptors. It is noted that an intrusive sampling program should be considered to characterise impacts associated with the APECs identified.
- It was recommended that JBS&G provide a scope for a Sampling Analysis and Quality Plan ('SAQP') and subsequent Detailed Site Investigation ('DSI') in order to characterise the nature, extent and risk of potential contamination onsite (site derived and offsite migration).

JBS&G has since prepared a SAQP reflecting the findings of the PSI to support a DSI which will be prepared to support future subdivision and development of the subject land. The outcomes of the SAQP are summarised below:

- Asbestos Investigations – The commercial/industrial structures which have recently been demolished are known to have included asbestos containing materials ('ACM'). However, there is considered a low potential for demolition to have resulted in the contamination of soils at the site with asbestos based on the controlled manner in which asbestos removal and subsequent demolition occurred. It is also possible that asbestos may be present in underground structures at the site, including pipes, infrastructure conduits, footings, and slabs which have not yet been identified. In the absence of any evidence of the existence of such structures, it is suggested that if they are identified in the future (during development activities), they are managed as unexpected finds.

  There is an area in the eastern portion of the subject land where fill material is observed to have been placed. Multiple PACM fragments were also observed across this area, and it is considered likely that these are (at least in part) associated with the demolition of a historical building in the area.

  Furthermore, a review of historical aerial photographs has identified that the southern portion of the subject land is reclaimed land. The fill utilised to create the current site levels is of unknown origin.

Based on the presence of uncontrolled fill, investigations will be required to extend to below the depth of imported fill materials where virgin/natural soils are present, which is anticipated to be 1.5 m bgl to 2 m bgl.

- Groundwater Investigations – The potentially contaminating activities conducted at the subject land historically also have the potential to have resulted in groundwater contamination. As such, it is proposed to complete a groundwater investigation to assess the quality of groundwater beneath the subject land. The installation of six groundwater monitoring wells is proposed.
- Acid Suflate Soils – Given the proposed redevelopment of the subject land, it is likely that ground disturbance events above occur. This will trigger the requirements for ASS investigation. ASS investigation will be required at both the northern rural residential lots, and the commercial/ industrial lots. The maximum depth of disturbance identified based on the provided plans is 4.3 m bgl. The guidelines require that investigation is undertaken to at least 1 m in excess of the maximum depth of disturbance. Therefore, it is proposed that soil bores for the purposes of characterising ASS are advanced to 6 m bgl, as a conservative measure.

Refer **Attachment 1 – Preliminary Site Investigation, Attachment 2 - PSI** and **Attachment 3 – Sampling and Analysis Quality Plan**.

FLORA AND VEGETATION

JBS&G's EAR confirmed the subject land is mainly comprised of cleared (or 'parkland cleared') paddocks, access roads, fences, and other man-made structures. As such, the majority of vegetation present is anticipated to be 'Completely Degraded'.

The vegetation surrounding the former buildings and the southern and eastern coastal portion of the subject land did not form part of the vegetation survey by Southern Ecology (2020).

In order to support the preparation and lodgement of the PSP with the City of Albany, a preliminary ecological assessment was completed by JBS&G to:

- confirm the presence/absence of the coastal samphire threatened ecological community identified in the desktop; and
- clarify the likelihood of occurrence of other key flora and vegetation values identified within the desktop assessment.

The preliminary ecological assessment was undertaken on 15 December 2022 by an Associate Ecologist with over 15 years of experience conducting ecological assessment in the South-west bioregion. A site walkover was carried out to visually inspect key features of the site, with a focus on identifying requirements for further ecological survey and any vegetation potentially representative of the Subtropical and Temperate Coastal Saltmarsh ecological community.

Saltmarsh vegetation aligning with key criteria of the Subtropical and Temperate Coastal Saltmarsh TEC/PEC was observed adjacent to, but outside of, the subject land.

No areas of vegetation clearly identifiable as saltmarsh or considered likely to represent the Subtropical and Temperate Coastal Saltmarsh TEC/PEC were observed within the subject land during the inspection visit.

One small area of low-lying vegetation in the eastern-most portion of the subject land, adjacent to the rail corridor and north-east of existing lot 402, exhibited superficial signs of periodic inundation and some lesser-defined features characteristic of saltmarsh vegetation and as such has some potential to constitute the TEC/PEC or an ecotone thereof.

Other areas of vegetation within the subject land were not found to overtly exhibit any key characteristic of the Subtropical and Temperate Coastal Saltmarsh TEC/PEC, or any other listed ecological community reported from the desktop study. No Threatened flora or fauna species identified from the EAR as having likely potential to occur were observed during the preliminary site walk-over. Further ecological survey in line with Government recommended methodologies (DBCA 2021; DSEWPaC 2013; EPA 2016; EPA2020) was identified to be required in order to confirm presence or absence of these ecological features on the subject land.

In response to this recommendation, an Ecological Survey has been undertaken. This has informed an updated EAR attached to this report, which confirms ecological matters on-site and measures to be implemented via future development of the site.

A brief summary is articulated below as it relates to Flora and Vegetation:

Observation: Saltmarsh vegetation aligning with key criteria of the Subtropical and Temperate Coastal Saltmarsh TEC was observed adjacent to and also within the site, with 0.48 ha of intact native vegetation on the eastern end of the site. This TEC is at risk from anthropogenic changes in sea level, with steep embankments preventing saltmarsh from retreating landward as sea levels rise. Other risks to the patch include weed invasion, ASS, stormwater drainage, reinforcement of embankments for development and pedestrian traffic.

Proposed Management: Potential impacts to Flora and Vegetation resulting from the development of the site are likely to be limited in nature due to the degraded condition of the vegetation, and the existing infrastructure that currently exists on the site.

The seawall proposed as part of the CHRMAP work being undertaken may have potential impacts on flora and vegetation. Potential impacts to the TEC resulting from seawall upgrades and drainage will require management.

An appropriate tree retention strategy and management plan will need to be determined and approved by the City of Albany.

It is noted that the area within the site is proposed to be public open space in response to draft modifications from the City of Albany. While not part of this amendment, this would likely aid with addressing the proposed management regime together with a managed response to the hybrid protection methodology identified in MP Roger's CHRMAP.

Refer **Attachment 4 – Environmental Assessment Report**, **Attachment 5 – Ecological Assessment and Attachment 6 – Ecological Survey**.

FAUNA AND HABITAT

As with flora and vegetation, proposed management measures to be implemented via future development has been informed by an Ecological Survey, with an updated EAR prepared to articulate proposed management measures as follows:

Observation: Six fauna habitats were identified within the site. Most of these were highly modified but still retained some value to fauna as evidenced by fauna observed during the field survey. The most significant fauna habitat identified within the site was Western Ringtail Possum habitat (Drainage Line and Damplands 1). This occupied 8.35 % (1.4 ha) of the site.

Proposed Management: Proposed management measures can be determined in consultation with relevant agencies. It is likely a trapping and relocation program may be recommended to mitigate impacts to the Western Ringtail Possum and Quenda.

PHYSICAL INFRASTRUCTURE AND SERVICES

STORMWATER AND FLOOD MANAGEMENT

JBS&G's EAR identified several existing stormwater drainage features within the subject land. These features are evident from both the City of Albany's Stormwater Mapping Database, the Water Corporation's 'Esinet' Asset Register and from the site Feature Survey.

There is an existing stormwater discharge point to Princess Royal Harbour located in the southwestern corner of the subject land between existing Lots 55 and 54.

Based on the available stormwater network information, stormwater from catchments to the north-west, north and north-east flow through the subject land and discharges to Princess Royal Harbour.

A portion of the existing open channel drain within Woolstores Place is currently a Water Corporation asset. Initial advice from the Water Corporation is that the portion of this open drain within Woolstores Place can be closed, replaced with a pipe system and transferred to the control of the City of Albany.

It is noted that the subject site is impacted by the construction of stormwater drainage infrastructure associated with the Albany Ring Road project. Through liaison with Main Roads Western Australia, the subject land's detailed stormwater design shall integrate with the Albany Ring Road design to ensure a coordinated design outcome.

In this regard, Hyd2o was commissioned to prepare a Local Water Management Strategy ('LWMS') to support the PSP (which can be provided upon request). The document provides a comprehensive overall assessment of the existing water management system of the area and how it will be modified and integrated with the new development to improve water sensitive urban design outcomes as a

result of the proposed land use change. Understanding key hydrological considerations has informed the development of this LWMS for the subject land.

WASTEWATER RETICULATION

There are no existing Water Corporation wastewater reticulation assets within or surrounding the site. The Water Corporation's long-term planning for the proposed development is to discharge to the existing Water Corporation network within Newton Street, approximately 1.8 kilometres to the north-west, via a Type 10 wastewater pumping station ('WWPS') located within the development and a DN100 pressure main. Internal sewers will be a combination of DN225 and DN150.

The WWPS should be located at a minimum distance of 30 metres from buildings to the centre of WWPS as per standard Water Corporation requirements outlined in Design Standard 51.

WATER RETICULATION

The following existing Water Corporation water reticulation assets surround the site:

- a DN150 AC main located within Princess Royal Drive and Lower Denmark Road to the north-east of the development;
- a DN58 AC main located within Frenchman Bay Road and Ware Road to the north of the development; and
- a DN200 AC main, DN300 steel main and DN525 steel main located within Woolstores Place within the development (existing Woolstores Place road reserve).

Water Corporation have not advised of specific water servicing requirements as part of this servicing report however it is understood that the existing water network has sufficient capacity to service the subject land.

GAS RETICULATION

ATCO Gas does not operate a reticulated gas network within the subject land. As such, no gas is currently available for the proposed development and would need to be extended at the developer's cost from Grey Street West and Festing Street, which are approximately 850 metres east of the subject land.

POWER

An analysis of Western Power's DFIS system has been conducted to determine the existing power supply configuration surrounding the development. The existing Western Power network surrounding the site consists of the following:

- HV overhead line on the North Eastern side of proposed Lot 1157. This HV line is located within the future road reserve and is likely to be abandoned after completion of the proposed subdivision;
- HV overhead line originating from the Northern side of Princess Royal Drive and continuing in a Westerly direction along Woolstores Place into Frenchman Bay Road. It is likely that

Western Power will require that this overhead line be replaced with underground HV cabling.

The Western Power Network Capacity Mapping Tool indicates that the forecasted remaining capacity for this area for 2023 is in the order of 5-10MVA. This figure indicates that capacity is available at the zone substation.

TELECOMMUNICATIONS

The proposed development will require a fibre ready pit and conduit network to be installed at the developer's cost. The pit and conduit will be designed in accordance with NBN standards and will be installed in the telecommunications alignment within the internal road reserves. Once installed and inspected, ownership of the pit and conduit network will be transferred to NBN.

The nearest existing NBN network is located within the road reserve in Frenchman's Bay Road. Based on the proposed development, it is likely that the connection will initially originate from existing pits along Frenchman's Bay Road.

Refer **Attachment 6 – Engineering Servicing Report**.

3.0 LOCAL PLANNING CONTEXT

STATE & REGIONAL PLANNING CONTEXT

GREAT SOUTHERN REGIONAL PLANNING AND INFRASTRUCTURE FRAMEWORK

The Great Southern Regional Planning and Infrastructure Framework was adopted in 2015 to provide strategic regional context and guide future land use planning and infrastructure investment in the Great Southern region.

The vision provides a clear statement of the values and aspirations that will guide development in the future:

A future that promotes economic development and diversification; offers an attractive lifestyle and improved quality of life to a growing multicultural population and recognises the important links between economic activity, ecosystem functions and the region's outstanding nature conservation, biodiversity and heritage values.

In this regard, the purpose of the proposed amendment is to operationalise the PSP being considered for the subject land. This PSP is proposed to promote redevelopment of the subject land to facilitate economic development, including tourism development based on the region's natural and heritage values. Therefore, the proposed amendment is entirely consistent with the Great Southern Regional Planning and Infrastructure Framework

LOWER GREAT SOUTHERN STRATEGY

The Lower Great Southern Strategy was adopted by the WAPC in 2016 to guide land use planning and provide strategic direction for the subregion over the next 20 years. The Lower Great Southern Strategy states the following vision for the subregion:

> *In the year 2035, the Lower Great Southern is a productive, innovative and successful area for intensive primary production and downstream processing. It is an attractive business, lifestyle and tourism destination with quality cultural, built and natural landscapes. It is recognised as a centre of excellence in natural resource management and provides a diverse range of health and wellbeing, higher education, training and employment opportunities. It is equipped to respond to local and global challenges and has supportive, vibrant, accessible and safe communities that embrace their Indigenous and historic heritage.*

Specific actions to meet with the need to maximise opportunities for development and growth of a sustainable tourism industry include zoning land for identified strategic tourism sites in local planning strategies to protect them for that purpose and to ensure local planning strategies respond to changing needs of the tourism sector and take advantage of emerging markets.

Key planning issues for Albany, relevant to the proposed LPS 2 amendment, include:

- Identifying opportunities for urban infill development;
- Fostering tourism development in key tourist areas;
- Guiding development of the Albany Waterfront;
- Accommodating predicted increases in the proportion of aged people in the community and meeting their associated care and health needs;
- Developing cultural and recreation facilities to cater for future growth;
- Achieving a balance between conservation and urban development and protecting Albany's natural assets; and
- Managing risks associated with seal level rise and climate change on existing and proposed infrastructure and coastal development areas.

These issues have each been considered by preparation and endorsement of the City of Albany Local Planning Strategy (the 'Strategy). It is considered that the proposed LPS 2 amendment offers the opportunity and capacity to provide urban infill development, to foster tourism development and responsible waterfront development, while managing risk associated with climate change (sea level rise). These factors are all considered by the PSP, which this amendment is designed to operationalise.

STATE PLANNING POLICIES

STATE PLANNING POLICY 2.6 – COASTAL PLANNING

State Planning Policy 2.6 – Coastal Planning ('SPP 2.6') provides for the long-term sustainability of Western Australia's coast and is relevant to those local governments that contain coastal areas. The

purpose of the policy is to provide guidance for decision making within the coastal zone including managing development and land use change, establishment of foreshore reserves and protecting, conserving and enhancing coastal values.

In this regard, we note that M P Rogers & Associates Pty Ltd has prepared a Coastal Hazard Risk Management and Adaptation Plan ('CHRMAP') for the PSP which will guide any future development of the subject land.

This will act as a specific tool for the subject land in lieu of broad provisions within LPS 2 for 'Special Control Area 15 - Princess Royal Harbour Inundation Area' ('SCA'). This results in the need to remove the application of 'Special Control Area 15' as it relates to the subject land to ensure the CHRMAP prepared specifically for the PSP area can be implemented.

STATE PLANNING POLICY 3.0 – URBAN GROWTH AND SETTLEMENT

State Planning Policy 3.0 – Urban Growth and Settlement ('SPP 3.0') is a broad sector policy that sets out the principles and considerations which apply to planning for urban growth and settlement in Western Australia. The purpose of the policy is to facilitate sustainable patterns of urban growth and settlement by setting out the requirements of sustainable settlements and communities and the broad policy for accommodating growth and change.

SPP 3.0 outlines general measures to create sustainable communities, plan liveable neighbourhoods, coordinate services and infrastructure, manage rural-residential growth and plan for aboriginal communities. These general measures should be considered in conjunction with issue-specific urban growth and settlement state planning policies which supplement SPP 3.0.

In this regard, the proposed amendment, and by extension, the PSP, is consistent and/or supports the following objectives of SPP 3.0:

- To build on existing communities with established local and regional economies, concentrate investment in the improvement of services and infrastructure and enhance the quality of life in those communities.
- To manage the growth and development of urban areas in response to the social and economic needs of the community and in recognition or relevant climatic, environmental, heritage and community values and constraints.
- To promote the development of a sustainable and liveable neighbourhood form which reduces energy, water and travel demand whilst ensuring safe and convenient access to employment and services by all modes, provides choice and affordability of housing and creates an identifiable sense of place for each community.

STATE PLANNING POLICY 3.6 – INFRASTRUCTURE CONTRIBUTIONS

State Planning Policy 3.6 – Infrastructure Contributions ('SPP 3.6') sets out the principles and requirements that apply to the establishment and collection of infrastructure contributions in new and established areas. The policy establishes objectives to coordinate the efficient and effective delivery of infrastructure to support population growth and development; provide clarity on the acceptable methods of collecting and coordinating contributions for infrastructure and provide the

framework for a transparent, equitable, and accountable system for apportioning, collecting and spending contributions.

Given the scale, ownership and extent of the subject land, as well as regional traffic being unable to traverse through the subject land, arrangements for developer contributions are not considered applicable in this instance and infrastructure can be considered through subdivision applications. The PSP outlines consideration for these matters.

STATE PLANNING POLICY 3.7 – PLANNING IN BUSHFIRE PRONE AREAS

State Planning Policy 3.7 – Planning in Bushfire Prone Areas ('SPP 3.7') provides a framework in which to implement effective, risk-based land use planning and development outcomes to preserve life and reduce the impact of bushfire on property and infrastructure. The policy emphasises the need to identify and consider bushfire risks in decision-making at all stages of the planning and development process whilst achieving an appropriate balance between bushfire risk management measures, biodiversity conservation and environmental protection.

The policy applies to all land which has been designated as bushfire prone by the Fire and Emergency Services Commissioner as well as areas that may have not yet been designated as bushfire prone but is proposed to be developed in a way that introduces a bushfire hazard.

In this regard, we note that a Bushfire Management Plan ('BMP') has been submitted with the PSP. Based on this, the preparation of a Bushfire Hazard Level assessment in support of the proposed rezoning is considered to be not applicable in this instance as the PSP, being a more detailed planning instrument, is currently being assessed.

We note that any future subdivision or development application over the subject land may require additional bushfire reporting in support of the individual application.

STATE PLANNING POLICY 5.4 – ROAD AND RAIL NOISE

State Planning Policy 5.4 – Road and Rail Noise ('SPP 5.4') provides guidance for the performance-based approach for managing and mitigating transport noise associated with road and rail operations. This policy applies where noise sensitive land uses are located within a specified distance of a transport corridor, new or major road or rail upgrades are proposed or where works propose an increase in rail capacity resulting in increased noise. The policy also sets out specific exemptions for where the policy requirements do not apply.

SPP 5.4 supports noise impacts being addressed as early as possible in the planning process to avoid land use conflict and achieve better land use planning outcomes. Considerations for decision-makers include ensuring that the community is protected from unreasonable levels of transport noise, whilst also ensuring the future operations of transport corridors.

In accordance with SPP 5.4, we note that a Transport Noise Assessment and associated Noise Contour Maps have been submitted as part of the PSP, which provides consideration towards the following matters:

- Identification of appropriate compatible land-use zoning that is commensurate with the function of the transport corridor;
- Design solutions that utilise street and lot configuration to screen and/or buffer noise;
- Consideration of density and built form outcomes that will help alleviate and/or manage noise;
- Outlining the need for additional noise mitigation measures through quiet house requirements in accordance with the guidelines, to be implemented via Part 1; and
- Consideration of appropriate future planning provisions to ensure more detailed planning is undertaken at the subdivision and development stage.

In this regard, the preparation of a Transport Noise Assessment in support of the proposed rezoning is considered to be not applicable given that the proposal is in accordance with the PSP.

We note that any future subdivision or development application over the subject land may require additional acoustic reporting in support of the individual application.

STATE PLANNING POLICY 7.0 – DESIGN OF THE BUILT ENVIRONMENT

State Planning Policy 7.0 – Design of the Built Environment ('SPP 7.0') is a broad sector policy relevant to all local governments. The policy sets out the objectives, measures, principles and processes that apply to the design and assessment of built environment proposals through the planning system. It is intended to apply to activity precinct plans, structure plans, local development plans, subdivision, development and public works.

SPP 7.0 contains ten (10) design principles which set out specific considerations for decision makers when considering the above proposals. These include, context and character, landscape quality, built form and scale, functionality and build quality, sustainability; amenity, legibility, safety, community and aesthetics.

In this regard, we note that each of the design principles contained within SPP 7.0 has been considered within the vision and design intent for the PSP.

STATE PLANNING POLICY 7.3 – RESIDENTIAL DESIGN CODES

Volume 1 and 2 of *State Planning Policy 7.3 – Residential Design Codes* ('SPP 7.3') provide design elements for single, grouped and multiple dwellings based on the designated residential density coding under the planning framework.

In this regard, the proposed PSP includes the designation of residential density codes between R50 and R160. We note that the PSP includes provisions relating to building height, plot ratio and building setbacks.

The remaining elements as it applies to residential development within the structure plan area will be deferred to the provisions of SPP 7.3.

In this way, the proposed amendment does not need to apply SPP 7.3 directly.

LOCAL PLANNING STRATEGY

CITY OF ALBANY LOCAL PLANNING STRATEGY

The City of Albany Local Planning Strategy was endorsed by the WAPC in 2019 to guide settlement growth and land use planning for Albany and its surrounds over a 10 to 15 year period and provides a rationale for zoning, land use and development controls in the City's Local Planning Scheme.

The Strategy will guide the City's progress towards its vision to be Western Australia's most sought after and unique regional city to work, live and visit. It provides strategic direction which, over the long term, is aiming to deliver a more compact city where residents will live closer to local shops, services and employment with easy access to public transport and greater ability to walk or cycle.

The subject land is identified by the Strategy as 'Investigation Area 2 – Woolstores'. The Strategy states that investigation areas are identified to acknowledge that additional research needs to be undertaken to determine appropriate strategic and statutory planning responses. More specifically, Investigation Area 2 includes a strategic direction to facilitate the preparation of a structure plan that shows how the site can be redeveloped.

- The Strategy also outlines that structure planning adjacent to the Albany Ring Road, such as the subject land, is to ensure the identification of measures to minimise impacts between the ring road, heavy fright routes and adjacent land uses occurs, such as the following:

- Application of land use and development controls for adjacent properties based on the recommendations of the Albany Heavy Freight Access Study (2003);
- Provision of adequate separation between incompatible or sensitive land uses and the ring road, particularly urban residential development;
- Application of road planning standards to minimise potential road user conflict;
- Noise and visual impact mitigation measures; and
- Minimise impacts on environmental values.

In this regard, the proposed amendment will facilitate the implementation of the PSP to, in turn, provide a positive response to the strategic direction of the Strategy.

LOCAL PLANNING POLICIES

LOCAL PLANNING POLICY – SIGNIFICANT TOURIST ACCOMMODATION SITES

In accordance with the recommendation of the Tourist Accommodation Planning Strategy, *Local Planning Policy – Significant Tourist Accommodation Sites* classifies the amendment area as a "Prime Tourism" site.

The Policy helps to maintain the site's role as a key tourist accommodation site by encouraging tourist, residential and non-residential uses. The Policy recommends:

- Hotel, tourist resort and residential land uses being developed; and
- Redevelopment be guided by a structure planning process.

In this regard, we note that the proposed amendment facilitates the implementation of the PSP to enable redevelopment of the subject land in accordance with the broad objectives of this policy.

LOCAL PLANNING POLICY – WOOLSTORES REDEVELOPMENT SITE

The main objectives of *Local Planning Policy – Woolstores Redevelopment Site* is to create an innovative and comprehensively planned urban development in close proximity to the town centre, while also accounting for noise and vibration associated with rail infrastructure and provision of public access to the waterfront. The Policy includes a number of broad development standards that aim to enable redevelopment that can respond to the objectives identified above.

In this regard, we note that the PSP will effectively replace this policy once approved, with the purpose of this amendment to facilitate the implementation of the PSP.

4.0 PROPOSAL

PRE-LODGEMENT ENGAGEMENT

As part of the process of preparing this report, preliminary comments on the amendment text and the context of this amendment request were sought from the Department of Planning, Land and Heritage ('DPLH')) and City of Albany.

The preliminary comments received from the DPLH concluded the need to simplify the proposed amendment text as it would only enable the PSP to be operational.

At a later stage and once development has substantially taken place over the subject land, the PSP can be normalised within LPS 2, with appropriate primary controls to be added to the LPS 2 text.

This has resulted in the amendment text proposed in this request.

PROPOSED SCHEME AMENDMENT

This Scheme Amendment request proposes to rezone the subject land to the 'Urban Development' zone under LPS 2 and assign site specific provisions (in Schedule 7, Table 17 – Site Specific Provisions) to the amendment area. The proposed rezonings include:

- Rezone Lots 895 and 1209 Woolstores Place, Mount Melville, Lot 1104 on Deposited Plan 165964, Lots 1156 and 1157 on Deposited Plan 171141 from 'Light Industry' to 'Urban Development';
- Rezone Lot 50 on Deposited Plan 426285, Lot 141 Woolstores Place, Mount Elphinstone, Lot 44 on Deposited Plan 171141 and Pin 583843 from 'Rural Smallholdings' to 'Urban Development';
- Rezone a 3,787m^2 portion of Lot 530 on Deposited Plan 408474 and Lot 529 Deposited Plan 408473 from 'Local Road' (Woolstores Place) to 'Urban Development', as notated on the Scheme Map; and

- Rezone Lot 1350 on Deposited Plan 184224 from 'Drainage/Waterway' reserve to 'Urban Development'.

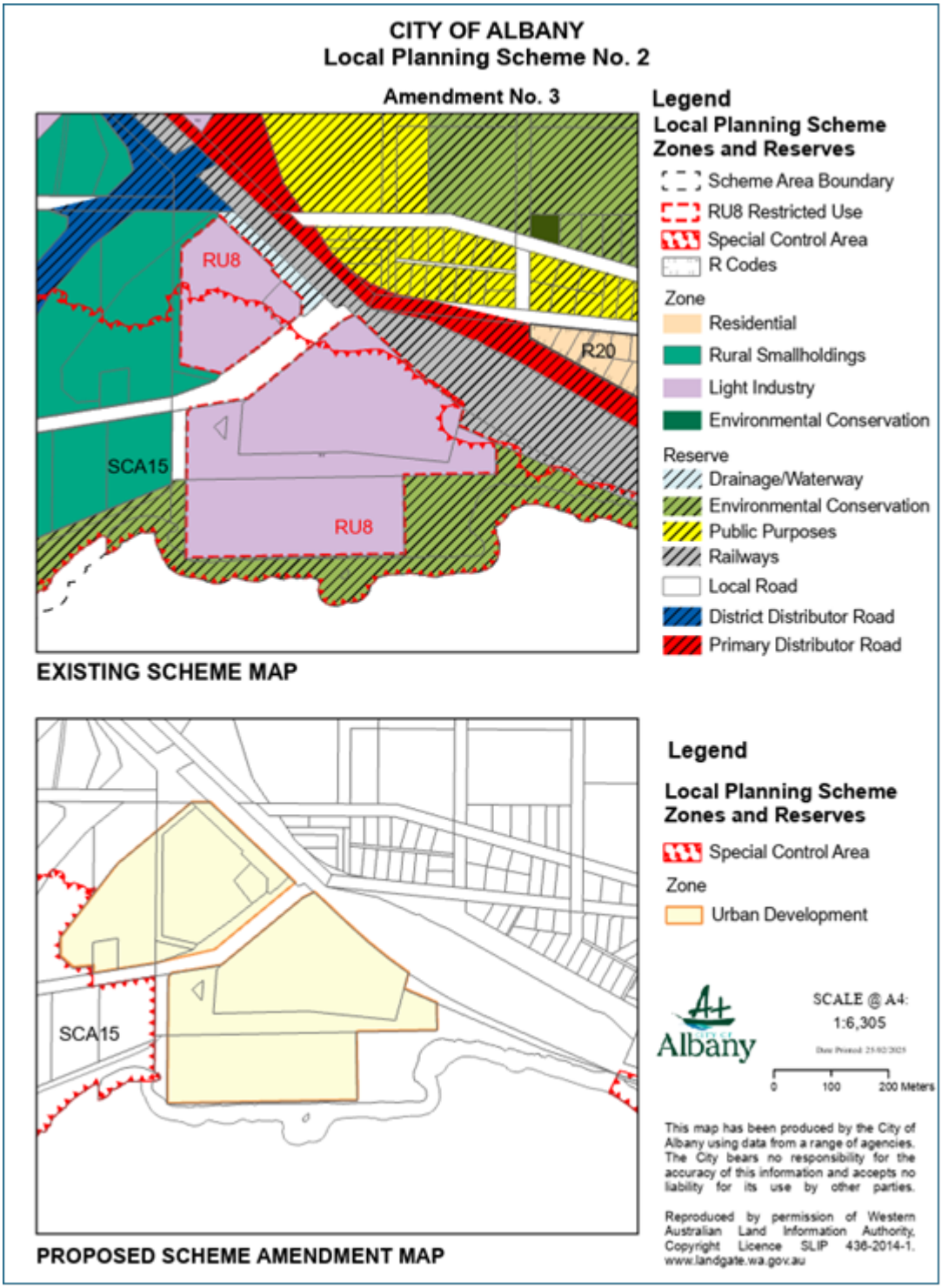
In proposing an 'Urban Development' zone, the following other amendments are proposed to support this outcome and the wider implementation of the PSP over the subject land:

- Delete RU8 from Schedule 3, Table 10.
- Add row 69 to Schedule 7, Table 17, as follows:
  - All development shall be constructed with a minimum finished floor level height of 2.5m AHD.
- Delete Special Control Area 15 – Princess Royal Harbour Inundation Area from the amendment area, as specified within the Scheme Map.

This request is being made in accordance with Section 75 of the *Planning and Development Act 2005* to facilitate the implementation of the PSP over the subject land. In due course, and once substantial progression and redevelopment of the PSP area has occurred, a separate amendment to LPS 2 can be undertaken to 'normalise' the primary controls of the PSP into the scheme text.

Refer **Figure 5 – Proposed City of Albany Local Planning Scheme No. 2 Zoning**.

Figure 5


CITY OF ALBANY
Local Planning Scheme No. 2
Amendment No. 3
RU8
R20
SCA15
RU8
EXISTING SCHEME MAP
Legend
Local Planning Scheme Zones and Reserves
Scheme Area Boundary
RU8 Restricted Use
Special Control Area
R Codes
Zone
Residential
Rural Smallholdings
Light Industry
Environmental Conservation
Reserve
Drainage/Waterway
Environmental Conservation
Public Purposes
Railways
Local Road
District Distributor Road
Primary Distributor Road
SCA15
PROPOSED SCHEME AMENDMENT MAP
Legend
Local Planning Scheme Zones and Reserves
Special Control Area
Zone
Urban Development
Albany
SCALE @ A4:
1:6,305
0
100
200 Meters
This map has been produced by the City of Albany using data from a range of agencies. The City bears no responsibility for the accuracy of this information and accepts no liability for its use by other parties.
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PLANNING JUSTIFICATION

ALBANY WOOLSTORES PRECINCT STRUCTURE PLAN

As noted, the proposed amendment is to facilitate the implementation of the PSP over the subject land. The PSP is required to be delivered by a strategic goal of the Strategy.

The PSP Area is divided into two (2) precincts, the Woolstores Precinct and the Commercial/Retail Precinct.

The intent for the Woolstores Precinct is to create a prime visitor destination with a lively blend of entertainment, cultural, commercial, retail and residential uses within a waterfront environment.

The Commercial/Retail Precinct has effective access to Woolstores Place and the wider Albany Ring Road infrastructure, which also provides a clear boundary or frame to the Precinct, along with the freight rail to the east. The Commercial/Retail Precinct is to be an employment generator at a neighbourhood scale, with high quality medium to large format commercial development taking advantage of access to the abovementioned roads, while providing a safe and inviting urban environment for pedestrians and workers fronting onto Woolstores Place.

The PSP includes a number of primary controls to guide redevelopment outcomes, inclusive building height, setbacks, plot ratio and other relevant development standards.

A number of documents are required to be delivered at future planning stages to support realisation of the vision and intent of the PSP.

The PSP was formally accepted by the City for assessment in August 2023, with public consultation concluding in October 2023. At its meeting in February 2024, the City's Council resolved to support the PSP and submit it to the DPLH for final assessment. This resolution included a number of recommended modifications to the PSP, for consideration by DPLH.

DPLH are currently considering the PSP and aim to have it considered by the Statutory Planning Committee in the last half of the 2024 calendar year.

The DPLH has advised that the proposed amendment should be initiated by Council, considered by the Environmental Protection Agency and approved by the Minister for Planning for the purpose of consultation prior, to approval of the PSP.

PROPOSAL OPPORTUNITIES AND CONSTRAINTS

During the preparation of this scheme amendment report and precinct structure plan for the subject land, various opportunities and constraints were identified for this proposal. Of relevance to the proposed scheme amendment, the following opportunities and constraints are summarised below.

KEY OPPORTUNITIES AND CONSTRAINTS

- Provision of Appropriate Land Uses – The proposed rezoning of the subject land to an 'Urban Development' zone will enable the implementation of the PSP. The PSP has been prepared based on the strategic direction of the City to facilitate a mixed use development, with a focus on tourism land uses at the subject land. In providing site specific planning via the PSP, the amendment request has an opportunity to remove the current 'Restricted Use 8' zoning and facilitate future land uses that are consistent with the City's strategic direction.
- Inundation and Erosion – A CHRMAP was prepared to support the PSP. This found that the existing assets, both proposed and existing, are likely to be at Low risk within the planning timeframe with the exception of a small portion of land located the north side of Woolstores Place, which is expected to be at a Medium risk level in 2122. An assessment for coastal erosion indicates that this land is at Low risk within the 100 year planning timeframe, however land south of Woolstores Place is likely to be at medium risk of impact in the 25 year planning timeframe, at least where the land abuts the water. While the existing SCA provisions for the harbour included within LPS 2 relate to the subject land, these provisions are broad in nature and do not account for the specific results and recommendations of the CHRMAP that supports the PSP. This results in the need to remove the application of the SCA as it relates to the subject land to ensure the CHRMAP prepared specifically for the PSP area can be implemented.
- Ecological considerations – While the vegetation within the subject land is largely degraded, the remnant foreshore vegetation to the east includes the Subtropical and Temperate Coastal Saltmarsh TEC. This has resulted in the need for management measures to be articulated as highlighted earlier in this report.
- Contamination - The PSI completed at the site has identified the following areas of potential environmental concern:
    - Asbestos contamination associated with the former site structures or illegal dumping/fly tipping activities.
    - Potential uncontrolled fill associated with the reclaimed land that the Woolstores warehouses were built on.
    - Historical industrial land use of the site.
    - Migration of potentially contaminated groundwater from up-gradient properties.

  As confirmed by JBS&G, a DSI should be undertaken support future stages of development to investigate the identified areas of potential environmental concern, to assess the potential risk to current and future site receptors.
- Acid Sulfate Soils ('ASS') - Soils within the subject land are considered to have a 'High to Moderate risk' of ASS occurrence within 3 metres of the natural soil surface. Should soil

disturbance of more than 100 m^3 be anticipated during the development of the subject land, then an ASS investigation should be completed to assess the nature and extent of ASS.

5.0 CONCLUSION

This scheme amendment request seeks to rezone the subject land from 'Rural Smallholdings', 'Light Industry' and 'Local Road' reserve to the 'Urban Development' zone under the *City of Albany Local Planning Scheme No. 2*.

This request is being made in accordance with Section 75 of the *Planning and Development Act 2005* to facilitate the implementation of the Albany Woolstores PSP over the subject land.

In light of the preceding sections of this report and enclosed technical reports, the following provides a summary of key considerations that demonstrate this request represents a reasonable and appropriate planning outcome for the subject land:

- The proposed amendment is to facilitate the implementation of the Albany Woolstores PSP over the subject land and allow for the structure plan to be considered by the Western Australian Planning Commission;
- The proposed amendment is consistent with the regional and local strategic planning frameworks to facilitate a mixed use development with a tourism focus;
- The proposed scheme amendment request together with the PSP provides an opportunity for the existing zoning restrictions for the past use of the site, being 'Restricted Use 8', and the broader area, being 'Special Control Area 15 – Princess Royal Harbour Inundation Area', to be removed and allow for a more efficient and suitable use of the subject land based on the site specific circumstances and management regime outlined in the PSP; and
- The planning and development process will in time provide the trigger for the provisions of the structure plan to be normalised into the *City of Albany Local Planning Scheme No. 2* consistent with orderly and proper planning.

In this regard, we respectfully request that the City of Albany initiates the proposed amendment to the *City of Albany Local Planning Scheme No. 2*.

OFFICIAL

Planning and Development Act 2005

RESOLUTION TO AMEND LOCAL PLANNING SCHEME

City of Albany Local Planning Scheme No. 2
Amendment No. 3

Resolved that the Local Government pursuant to section 75 of the *Planning and Development Act* 2005, amend the above Local Planning Scheme by:

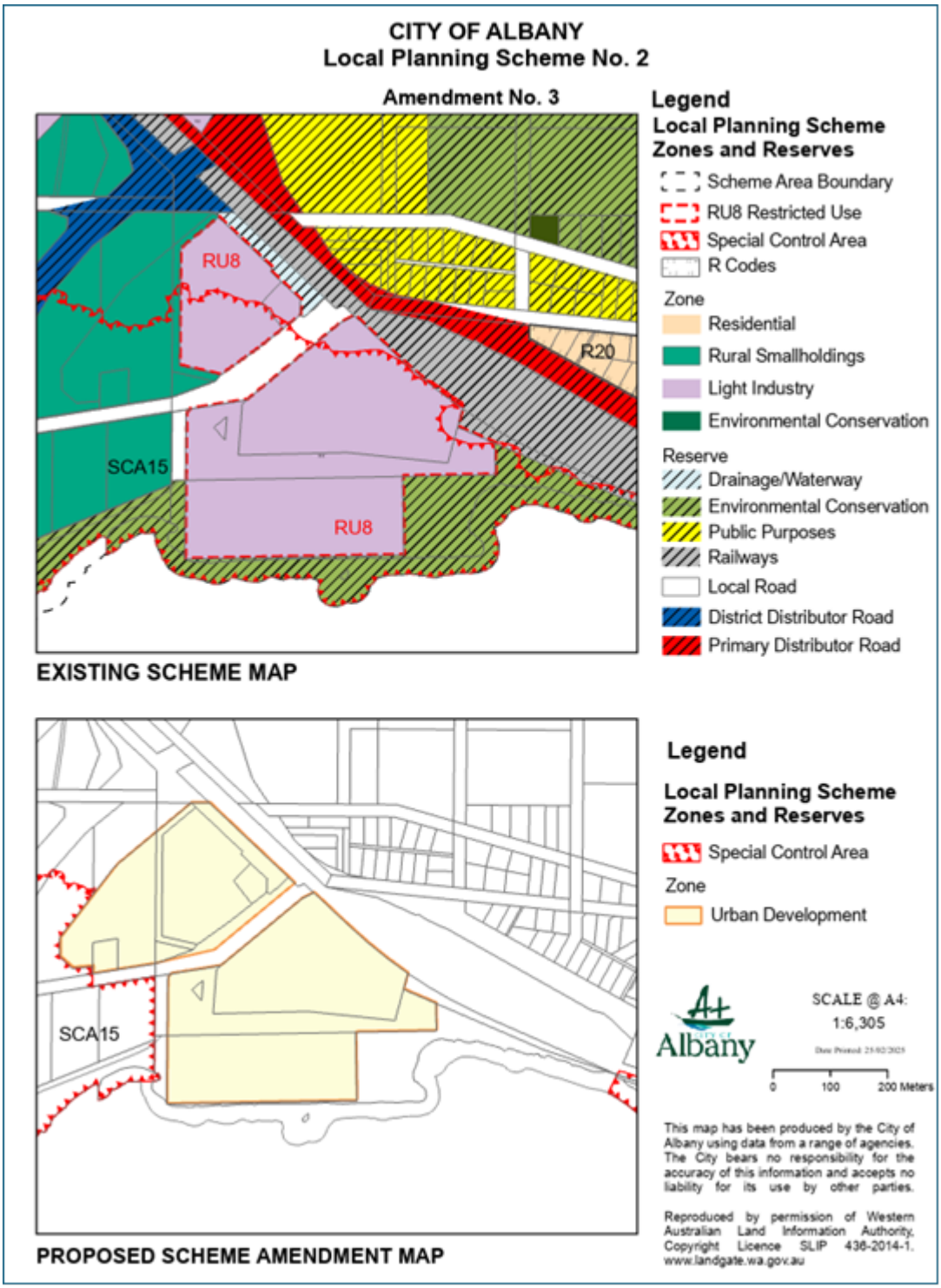
1. **Rezone Lots 895 and 1209 Woolstores Place, Mount Melville, Lot 1104 on Deposited Plan 165964, Lots 1156 and 1157 on Deposited Plan 171141 from 'Light Industry' to 'Urban Development';**
2. **Rezone Lot 50 on Deposited Plan 426285, Lot 141 Woolstores Place, Mount Elphinstone, Lot 44 on Deposited Plan 171141 and Pin 583843 from 'Rural Smallholdings' to 'Urban Development';**
3. **Rezone a 3,787m^2 portion of Lot 530 on Deposited Plan 408474 and Lot 529 Deposited Plan 408473 from 'Local Road' (Woolstores Place) to 'Urban Development', as notated on the Scheme Map;**
4. **Rezone Lot 1350 on Deposited Plan 184224 from 'Drainage/Waterway' reserve to 'Urban Development';**
5. **Delete RU8 from Schedule 3, Table 10.**
6. **Add row 69 to Schedule 7, Table 17, as follows:**

No.	Description of Affected Lands	Standards
69	Lots 895 and 1209 Woolstores Place, Mount Melville Lot 141 Woolstores Place, Mount Elphinstone Lot 50 Woolstores Place, Mount Elphinstone Lot 1104 on Deposited Plan 165964 Lots 44, 1156 and 1157 on Deposited Plan 171141 Lot 1350 on Deposited Plan 184224 A portion of Lot 530 on Deposited Plan 408474 Lot 529 on Deposited Plan 408473 Lot 501 on Deposited Plan 409116 Pin 583843	1. All development shall be constructed with a minimum finished floor level height of 2.5m AHD.

7. **Delete Special Control Area 15 – Princess Royal Harbour Inundation Area from the amendment area, as specified within the Scheme Map.**

OFFICIAL

AMENDMENT MAP



OFFICIAL

FORM 6A

COUNCIL RESOLUTION TO PREPARE AND ADVERTISE

This standard Amendment was advertised by resolution of the Council of the City of Albany at the Ordinary Meeting of the Council held on the 22 day of October 2024.

Greg Stocks

.....

GREGORY STOCKS

MAYOR/SHIRE PRESIDENT

.....

ANDREW SHARPE

CHIEF EXECUTIVE OFFICER

COUNCIL FINAL RECOMMENDATION

This Amendment is recommended for support by resolution of the City of Albany at the Ordinary Meeting of the Council held on the day of 2024 and the Common Seal of the City of Albany was hereunto affixed by the authority of a resolution of the Council in the presence of:

.....

MAYOR/SHIRE PRESIDENT

.....

CHIEF EXECUTIVE OFFICER

WAPC ENDORSEMENT (r.63)

.....

DELEGATED UNDER S.16 OF

THE P&D ACT 2005

DATE.....

APPROVAL GRANTED

.....

MINISTER FOR PLANNING

DATE.....

Woolstores Place, Mount Elphinstone, Albany

Engineering Servicing Report

Civil, Electrical and Communication Services

4 April 2023

Ref: 301251018

PREPARED FOR:

Andrew Cumming
Row Group

PREPARED BY:

Travis Demeza / Fred Wallefeld

Stantec

Revision Schedule

Revision No.	Date	Description	Prepared by	Project Manager Final Approval
0	15/11/2022	Preliminary – issued for comment	Fred Wallefeld / Rocco Pienaar	Travis Demeza
1	31/03/2023	Original Issue	Travis Demeza	Travis Demeza
2	04/04/2023		Travis Demeza	Travis Demeza

Disclaimer

The conclusions in the Report are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

Stantec has assumed all information received from the Client and third parties in the preparation of the Report to be correct. While Stantec has exercised a customary level of judgment or due diligence in the use of such information, Stantec assumes no responsibility for the consequences of any error or omission contained therein.

This Report is intended solely for use by the Client in accordance with Stantec's contract with the Client. While the Report may be provided to applicable authorities having jurisdiction and others for whom the Client is responsible, Stantec does not warrant the services to any third party. The report may not be relied upon by any other party without the express written consent of Stantec, which may be withheld at Stantec's discretion.

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1. Executive Summary

This servicing report has been prepared by Stantec Australia Pty Ltd and aims to support the preparation of structure plans for the proposed subdivision of various lots at Woolstores Place, Albany within the City of Albany.

Key findings of this report are as follows:

- The site contains several existing stormwater drainage features and discharge points to Princess Royal Harbour from existing upstream catchments
- Conceptual stormwater drainage designs are provided taking into consideration upstream catchments and based upon conveying the 20% AEP storm event within piped networks and flood routing the 1% AEP storm event via road reserves
- Conceptual stormwater drainage designs are inclusive of treatment of stormwater flows from impervious surfaces. Online bioretention cells within road reserves are anticipated for public road infrastructure. Future lots shall require to consider treatment of flows at source within future development layouts
- Attenuation of post-development stormwater flows is not recommended, due to close proximity of downstream receiving water body
- Groundwater levels inclusive of long-term seawater level rise have been considered whilst setting indicative conceptual road and lot levels
- The site contains no existing Water Corporation wastewater reticulation assets and as such a Type 10 Wastewater Pumping Station and 1.8km of off-site Wastewater Pressure Main will be required to service the development, discharging to existing Water Corporation assets within Newton Street
- The site contains existing Water Corporation water distribution and water reticulation assets, that will require consideration for protection during future detailed engineering designs
- Water Corporation have confirmed that the existing water network has sufficient capacity to service the development
- Western Power mapping tools suggest sufficient capacity within the existing network to service the development
- Existing Communications assets are located near the site, providing available connectivity
- There is no existing ATCO gas reticulation network adjacent to the site

The following Engineering related items will be required to support future subdivision application and subsequent clearance of title:

- CWFA with Water Corporation for off-site wastewater discharge
- Detailed Hydrologist analysis of upstream stormwater drainage catchment areas as part of detailed engineering designs
- Confirmation of existing stormwater drainage discharge locations to Princess Royal Harbour by further feature survey
- Confirmation of stormwater strategy with the City of Albany as part of detailed engineering designs inclusive of roadway levels, lot levels and stormwater drainage
- Application to Western Power to confirm detailed engineering requirements
- Application to NBN to confirm detailed engineering requirements
- Application to ATCO Gas for reticulated gas, if so required by the Developer

2. Introduction

Stantec Australia Pty Ltd has been engaged by Rowe Group to prepare this report in support of structure plans for the proposed subdivision of various lots at Woolstores Place, Albany within the City of Albany.

This report discusses the following engineering and infrastructure items necessary to service the proposed development:

- Stormwater Management
- Wastewater Reticulation
- Water Reticulation
- Gas Reticulation
- Power Reticulation
- Communications

Servicing investigations have been undertaken by Stantec to establish the availability of existing infrastructure in the area and their capacity to service the proposed development.

No liaison with the relevant Authorities have taken place as part of this desktop study, unless noted otherwise in the report.

The contents of this report are based on the ROWE GROUP Development Concept Plan 9116-CON-02-A (refer Appendix A).

This report does not provide professional advice with respect to items such as Traffic, Transport, Coastal Engineering, Hydrological items such as groundwater rise and flood management, Aboriginal Heritage, Landscaping, Bushfire, Acoustics (noise) or detailed Geotechnical or Environmental issues. We recommend that you liaise with relevant specialist consultants in this regard.

In preparing this report we advise that we have collaborated with, and relied upon advice from, Hydrological and Coastal Engineering consultants to consider effect of long-term sea level rise, ground water interaction and existing upstream stormwater drainage catchments to assist with the development of wider local water management strategies.

3. Existing Site Conditions

3.1 General

The Site comprises various existing lots and totals approximately 16.5Ha.

The Site is located approximately 2.0km west of the Albany CBD on the northwest shore of Princess Royal Harbour.

The Site is generally bounded by Frenchman Bay Road (and the proposed Albany Ring Road interchanges) to the northwest, by existing residential lots to the west, by the existing Rail Line to the northeast and Princess Royal Harbour and associated foreshore to the south.

Existing land uses vary across the different lots, from industrial to vacant, reserve, semi-rural and residential.

3.2 Topography & Vegetation

The site generally grades in a southerly direction, from a high point of RL 7m AHD in the northern corner of Lot 1157, to a low point of approximately RL 1m AHD along the southern boundary to Princess Royal Harbour. However, levels across the site have been altered, with road reserves and several lots locally filled to approximately RL 3m AHD to accommodate their existing developments.

There are several existing drainage lines though out the site, including an open drain running alongside Woolstores Place which drains in a westerly direction. This drain is currently a Water Corporation managed asset. There are several, potentially seasonal, existing water bodies within the Site.

The Site consists of a mix of developed lots and larger undeveloped lots with grasses/sedges and scattered taller vegetation.

Refer to Appendix B for site survey plan depicting vegetation and contours. Please note that at the time of writing both demolition and construction works were in progress on, and adjacent to, the site as part of the Albany Ring Road project.

For more information regarding the vegetation and hydrology of the site, please refer to investigations and reports by others.

3.3 Geotechnical

Refer to investigations by others.

3.4 Groundwater

Refer to investigations by others.

3.5 Acid Sulphate Soils (ASS)

The site is located in an area of High to Moderate ASS Risk as mapped by the Department of Agriculture, Water and the Environment.

As such it is anticipated that ASS will require management in the process of developing this site.

Refer to Appendix H.

4. Servicing

4.1 Stormwater and Flood Management

A desktop review of the area has identified several existing stormwater drainage features within the proposed development area. These features are evident from both the City of Albany's Stormwater Mapping Database (attached as Appendix C), the Water Corporation's 'Esinet' Asset Register and from the site Feature Survey (attached as Appendix B). It is noted that the surveyor was not able to access and survey the existing open drain along Woolstores Place.

There is an existing stormwater discharge point to Princess Royal Harbour located in the southwestern corner of the site between adjacent existing Lots 55 and 54. Additional discharge points may exist within the site and it is recommended that these are confirmed by survey and inspection prior to detailed engineering designs.

Based on the available stormwater network information, it is assumed that stormwater from catchments to the north-west, north and north-east flow through the site and discharges to Princess Royal Harbour. The location and magnitude of these flows (within open drains, pipes or as overland flow) requires further investigation. Appropriate allowance will need to be made for the safe conveyance of both minor and major event stormwater flows from upstream catchments through the site to Princess Royal Harbour. This will require detailed analysis of both the development site as well as the upstream catchments. Minor (up to the 20% AEP*) event flows should be conveyed within an inground piped stormwater drainage system. Major (up to the 1% AEP) event flows shall be conveyed to Princess Royal Harbour via the road network and POS areas with appropriate flow depths, velocities and freeboard to proposed lot levels and building floor levels (*Desired capacity of the inground pipe drainage conveying upstream flows through the site to be confirmed with Client through design process. A capacity greater than 20%AEP may be desirable).

A portion of the existing open channel drain within Woolstores Place is currently a Water Corporation asset. Initial advice from the Water Corporation is that the portion of this open drain within Woolstores Place can be closed, replaced with a pipe system and transferred to the control of the City of Albany. Refer to advice attached in Appendix I.

Stormwater Runoff generated within the site will need to be collected, controlled, treated and discharged (or infiltrated) to the satisfaction of the City of Albany and Department of Water.

The collection and control of stormwater runoff for the 'minor' event is envisaged to be via the provision of a local authority managed stormwater drainage pipe network located within the road reserve, and with the provision of piped stormwater connections to proposed lots. This pipe system shall conform to the requirements of the City of Albany.

The treatment of stormwater runoff should include the removal of pollutants, and this is proposed to be via biofiltration and the use of gross pollutant traps. Given the physical constraints of the site (grade and level of receiving waters) it is recommended that runoff be treated via small, distributed biofiltration structures (swales and basins) prior to discharge into the pipe system, rather than collection via the pipe system and treatment in a centralised 'end of line' structure (basin) prior to discharge to Princess Royal Harbour. This approach can be further discussed with the Client and confirmed during the design process. Biofiltration structures, with a base area equivalent to 2% of the impervious areas they are treating, shall be provided to treat both public (road) and private (lot) catchment runoff. These structures are envisaged to in the form of a combination of central median biofiltration swales and small 'pocket' roadside biofiltration basins for public road reserves, with future development of lots requiring to treat impervious areas within their development layout in accordance with industry best practices.

Attenuation of stormwater runoff (to avoid discharge rates exceeding the flow capacity of downstream stormwater infrastructure) is not considered necessary given the site's proximity to, or direct discharge to, the large capacity receiving water body (Princess Royal Harbour). This approach shall be confirmed with the City of Albany prior to detailed design.

Note: the site is impacted by the construction of stormwater drainage infrastructure associated with the Albany Ring Road project. The sites' detailed stormwater design shall integrate with the ARR design to ensure a coordinated design outcome.

Indicative groundwater modelling, inclusive of long-term seawater level rise, has been reviewed and incorporated as part of initial stormwater and roadway concepts. Imported fill will be required as part of the subdivisional design to ensure minimum offsets to worst-case, long-term groundwater levels to underside of future building footprints and roadways.

Refer Appendix C for existing stormwater drainage infrastructure. Refer to Appendix D for Stormwater Design and Flood Routing Concepts and indicative road and lots levels to suit groundwater modelling. Refer to Appendix J for ARR Stormwater Designs.

4.2 Wastewater Reticulation

There are no existing Water Corporation (WC) wastewater reticulation assets within or surrounding the site.

The WC's long-term planning for the proposed development is to discharge to the existing WC network within Newton Street, approximately 1.8 kilometres to the north-west, via a Type 10 wastewater pumping station (WWPS) located within the development and a DN100 pressure main. Internal sewers will be a combination of DN225 and DN150.

The WWPS should be located within a proposed Public Open Space, with minimum distance from buildings to centre of WWPS pumping well of 30m, as per standard WC requirements outlined in Design Standard 51 (DS51).

This proposed pressure main route may be subject to clearing permit requirements and other environmental constraints.

The WWPS and associated pressure main may be subject to a Customer Funded Works Agreement and reimbursed by the WC. This will need to be confirmed during subsequent phases of the development.

As part of preparing this servicing report we have liaised with the Water Corporation to confirm the site's Wastewater Reticulation requirements. Water Corporation have confirmed that the aforementioned future infrastructure will be required to service the proposed structure plan area based upon indicative development flows.

Refer to Appendix E for Water Corporation wastewater planning information. Refer to Appendix F for Schematic sewer concept design.

4.3 Water Reticulation

The following existing Water Corporation (WC) water distribution and water reticulation assets exist within the site and surrounding the site:

- a DN150 AC main located within Princess Royal Drive and Lower Denmark Road to the north-east of the development
- a DN58 AC main located within Frenchman Bay Road and Ware Road to the north of the development
- a DN200 AC main, DN300 steel main and DN525 steel main located within Woolstores Place within the development (existing Woolstores Place road reserve). NOTE: both the DN300 and DN525 steel mains are distribution mains and critical assets for the WC and require measured consideration with respect to development offsets as per the WC's technical guideline for safely working near Water Corporation assets document. As a minimum a building footprint will not need WC specific prior approval if it is located 10m from the existing assets. Ground disturbance activities will require WC specific prior approval if within 6m from their existing assets. These assets will require consideration during future detailed engineering designs.

Water Corporation have not advised of specific water servicing requirements as part of this servicing report however we understand that the existing water network has sufficient capacity to service the proposed development.

This will need to be confirmed with the Water Corporation during detailed design or via a formal planning request.

Refer to Appendix G, for existing water reticulation assets.

4.4 Gas Reticulation

ATCO Gas (ATCO) does not operate a reticulated gas network adjacent the Site and as such, no gas is currently available for the proposed development. The nearest existing ATCO gas network is located approximately 800m to the east, within Festing Street, or approximately 1000m to the east, within Grey Street West.

If the Developer wishes to connect the proposed development to reticulated gas at the time of subdivision, then an application for off-site gas headworks can be made to ATCO Gas. The Developer will be responsible for all construction costs of all off-site headworks.

4.5 Underground Power

4.5.1 Existing Infrastructure

An analysis of Western Powers (WP) DFIS system has been conducted to determine the existing power supply configuration surrounding the development. The existing Western Power network surrounding the site consists of the following:

- HV overhead line on the North Eastern side of proposed Lot 1157. This HV line is located within the future road reserve and is likely to be abandoned after completion of the proposed subdivision
- HV overhead line originating from the Northern side of Princess Royal Drive and continuing in a Westerly direction along Woolstores Place into Frenchman Bay Road. It is likely that Western Power will require that this overhead line be replaced with underground HV cabling

4.5.2 Infrastructure Capacity / Proposed Upgrades

Based on the proposed development (Lots 4 - 7) and the indicated lot yield, it is likely that the site power demand will be in the vicinity of 1 MVA. This is based on the standard Western Power load allocation of 3.1kva per unit for residential units.

The Western Power Network Capacity Mapping Tool indicates that the forecasted remaining capacity for this area for 2023 is in the order of 5-10MVA (as at 8/11/2022). This figure indicates that capacity is available at the zone substation.

In order to service the proposed subdivision, it is likely that a new switchgear site will be established on one of the lots, probably the North Western corner of Lot 7. The switchgear site will obtain power from the newly undergrounded hv line in Woolstores Place and will provide an hv supply to two transformers, 1 each on Lots 7 & 6. These transformers will provide low voltage connections to Lots 4 - 7.

It should be noted that due to the dynamic nature of Western Power's network, infrastructure requirements and connection points referred above may differ when applications are placed in the future. It is recommended that a planning study be undertaken closer to the date of proposed load uptake to determine if the above information is still valid.

4.6 Telecommunications

The proposed development will require a fibre ready pit and conduit network to be installed at the developer's cost.

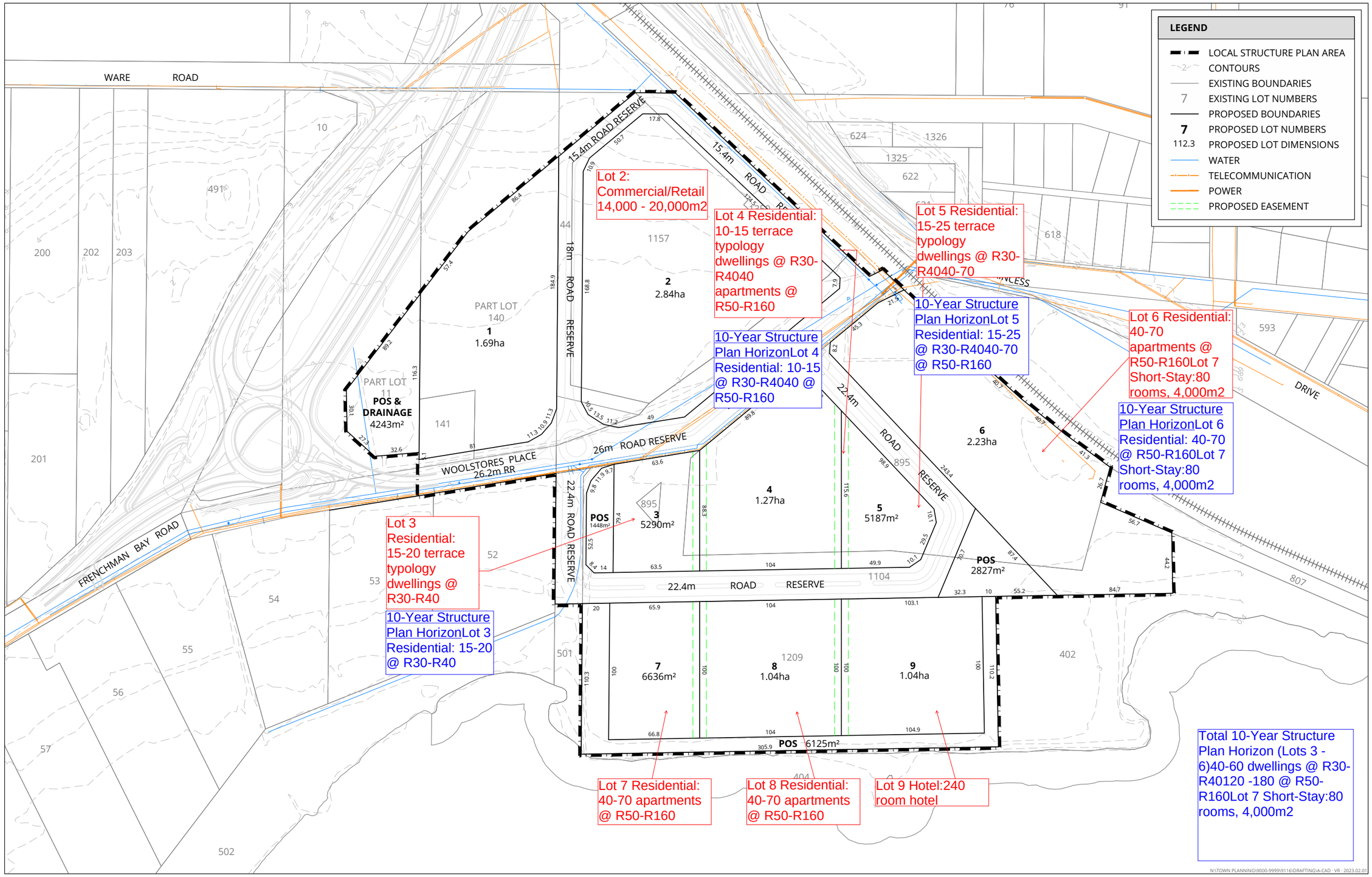
The pit and conduit will be designed in accordance with NBN standards and will be installed in the telecommunications alignment within the internal road reserves. Once installed and inspected, ownership of the pit and conduit network will be transferred to NBN.

An analysis of NBN's DBYD has been conducted to determine the location of the existing NBN network that would supply the proposed pit and conduit network. The nearest existing NBN network is located within the road reserve in Frenchman's Bay Road. Based on the proposed development, it is likely that the connection will initially originate from existing pits along Frenchman's Bay Road. Minor works (relocations) may be required in this vicinity to accommodate the new connection to the subdivision.

It should be noted that due to the dynamic nature of NBN's network, infrastructure requirements and connection points referred above may differ when applications are placed in the future.

In addition to the new pit and conduit network, the developer will be required to remove all existing telecommunications infrastructure that may be located within the proposed new lots.

Appendix A – Indicative Concept Plan & Density



DEVELOPMENT CONCEPT
VARIOUS LOTS, WOOLSTORES PLACE
MOUNT ELPHINSTONE, ALBANY

DRAFT

N

0 62.5 m
SCALE @ A3: 1:2500

9116-CON-02-A

DRAWN: VR
DATE CREATED: 2023.02.01
PROJECTION: MGA50 GDA94
CADASTRE: LANDGATE
SURVEY: HARLEY DYKSTRA 23304-01A

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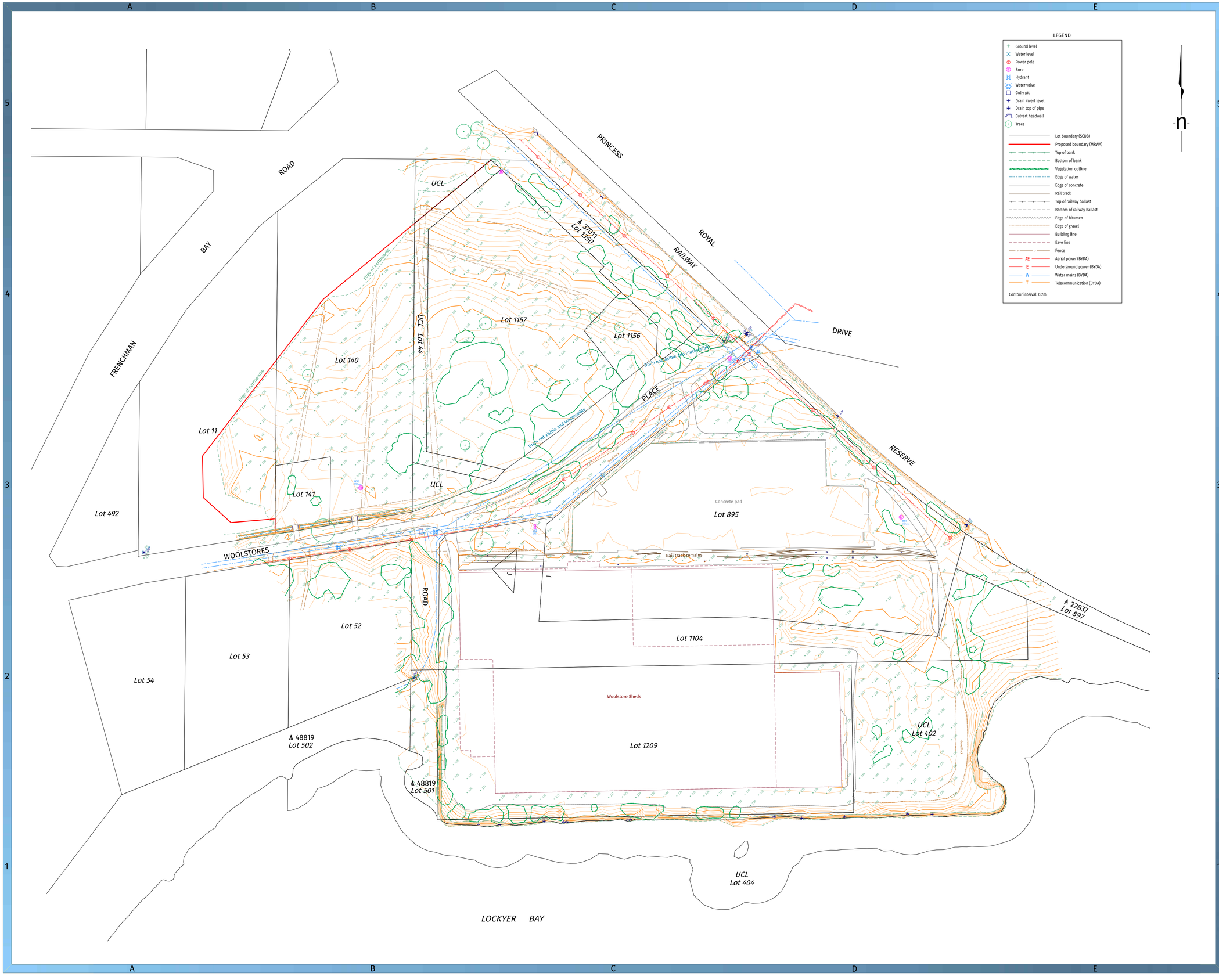
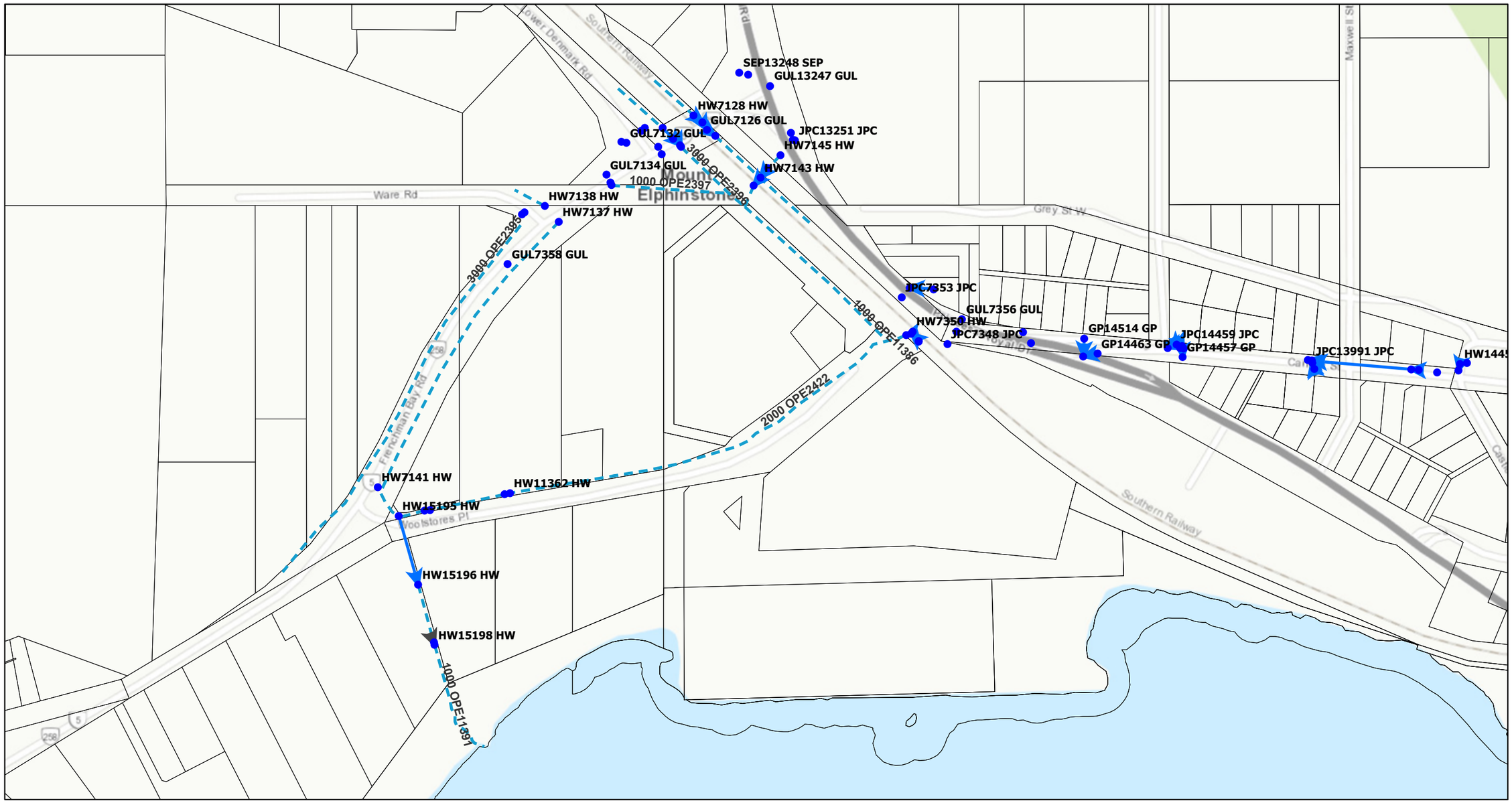
ROWE GROUP DESIGN

Appendix B – Site Survey Plan


PRINCESS ROYAL RAILWAY DRIVE
BAY ROAD
FRENCHMAN
PLACE
RESERVE
WOOLSTORES ROAD
LOCKYER BAY
UCL
UCL Lot 44
Edge of earthworks
Edge of earthworks
Drain not visible and inaccessible
Drain not visible and inaccessible
Lot 11
Lot 140
Lot 141
Lot 492
Lot 1157
Lot 1156
Lot 1350
37011
Lot 52
Lot 53
Lot 54
Lot 1104
Lot 1209
Lot 895
Concrete pad
Rail track remains
Woolstore Sheds
Lot 897
22837
Lot 502
48819
Lot 501
48819
UCL
Lot 402
UCL
Lot 404
Lot 1
Lot 2
Lot 3
Lot 4
Lot 5
Lot 6
Lot 7
Lot 8
Lot 9
Lot 10
Lot 11
Lot 12
Lot 13
Lot 14
Lot 15
Lot 16
Lot 17
Lot 18
Lot 19
Lot 20
Lot

Appendix C – Woolstores Existing Stormwater

City of Albany Stormwater Network



11/8/2022, 11:31:21 AM

- DRAINAGE PITS
- DRAINAGE PIPES
- LONGITUDINAL - Longitudinal
- OPEN DRAIN - Constructed Open Drain
- CROSSOVER - Property entrances
- CULVERT - Box culvert
- Cadastre (LGATE-001)

1:4,514

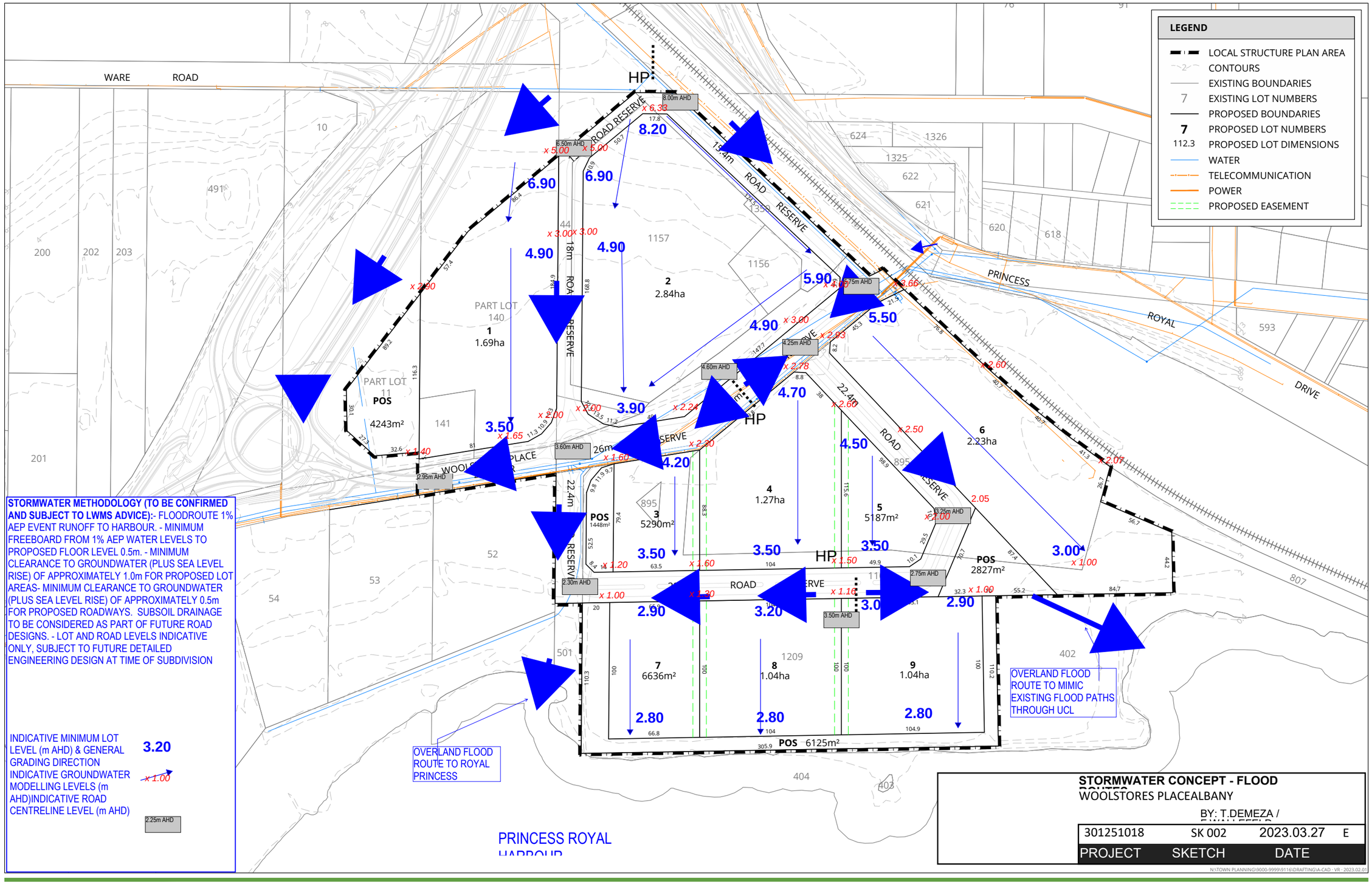
0 0.04 0.09 0.18 mi

0 0.05 0.1 0.2 km

Esri, HERE, Garmin, USGS

City of Albany
City of Albany

Appendix D – Concept Stormwater Pipe System SK001E & Concept 1% AEP Routing Stormwaer SK002E



DEVELOPMENT CONCEPT

VARIOUS LOTS, WOOLSTORES PLACE
MOUNT ELPHINSTONE, ALBANY

DRAFT

N

0 62.5 m
SCALE @ A3: 1:2500

9116-CON-02-A

DRAWN: VR
DATE CREATED: 2023.02.01
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CADASTRE: LANDGATE
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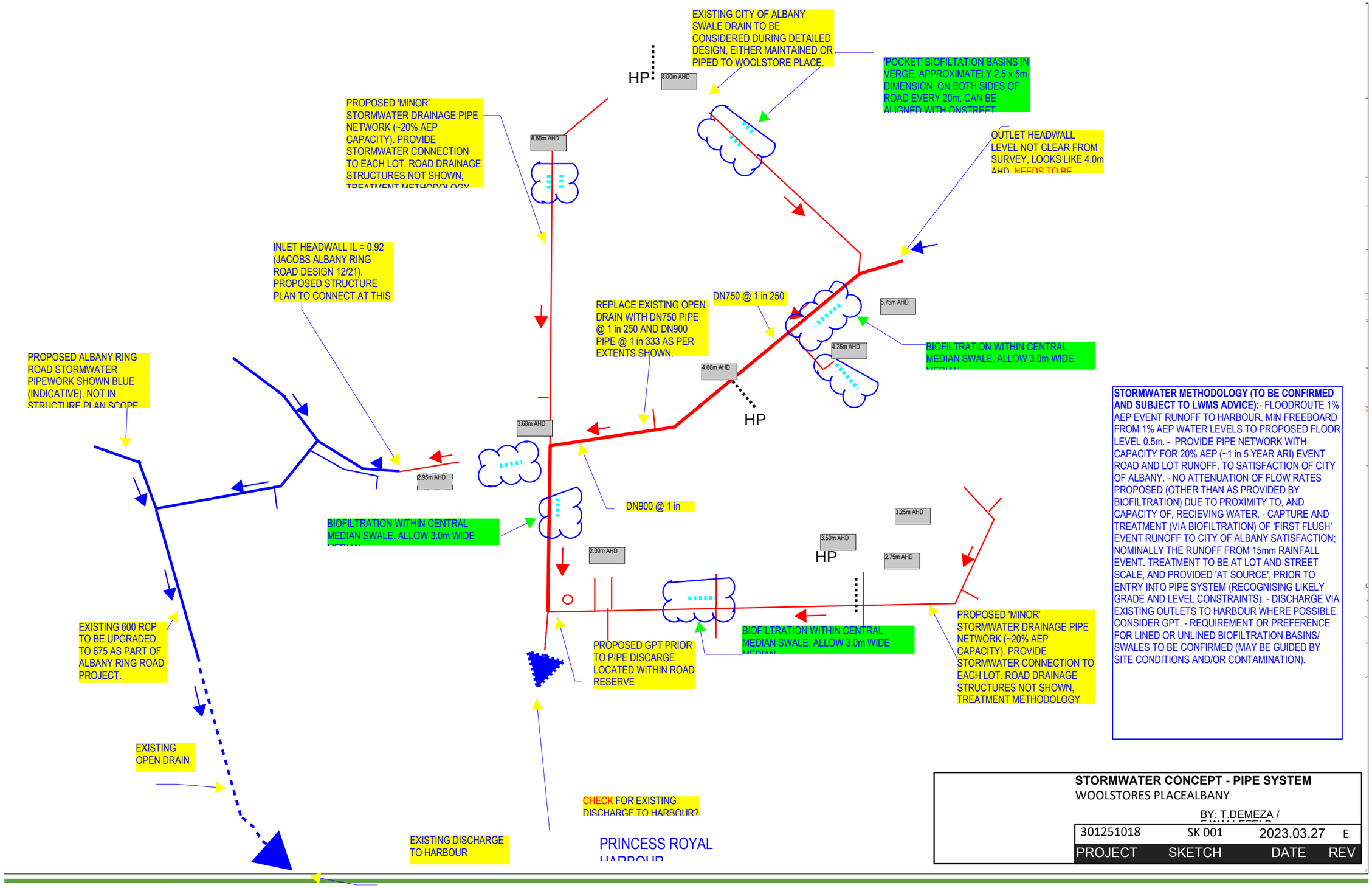

STORMWATER METHODOLOGY (TO BE CONFIRMED AND SUBJECT TO LWMS ADVICE):- FLOODROUTE 1% AEP EVENT RUNOFF TO HARBOUR. MIN FREEBOARD FROM 1% AEP WATER LEVELS TO PROPOSED FLOOR LEVEL 0.5m. - PROVIDE PIPE NETWORK WITH CAPACITY FOR 20% AEP (~1 in 5 YEAR ARI) EVENT ROAD AND LOT RUNOFF. TO SATISFACTION OF CITY OF ALBANY. - NO ATTENUATION OF FLOW RATES PROPOSED (OTHER THAN AS PROVIDED BY BIOFILTRATION) DUE TO PROXIMITY TO, AND CAPACITY OF, RECIEVING WATER. - CAPTURE AND TREATMENT (VIA BIOFILTRATION) OF 'FIRST FLUSH' EVENT RUNOFF TO CITY OF ALBANY SATISFACTION; NOMINALLY THE RUNOFF FROM 15mm RAINFALL EVENT. TREATMENT TO BE AT LOT AND STREET SCALE, AND PROVIDED 'AT SOURCE', PRIOR TO ENTRY INTO PIPE SYSTEM (RECOGNISING LIKELY GRADE AND LEVEL CONSTRAINTS). - DISCHARGE VIA EXISTING OUTLETS TO HARBOUR WHERE POSSIBLE. CONSIDER GPT. - REQUIREMENT OR PREFERENCE FOR LINED OR UNLINED BIOFILTRATION BASINS/ SWALES TO BE CONFIRMED (MAY BE GUIDED BY SITE CONDITIONS AND/OR CONTAMINATION).

STORMWATER CONCEPT - PIPE SYSTEM
WOOLSTORES PLACEALBANY
BY: T.DEMEZA /

PROJECT	SKETCH	DATE	REV
301251018	SK 001	2023.03.27	E

DEVELOPMENT CONCEPT
VARIOUS LOTS, WOOLSTORES PLACE
MOUNT ELPHINSTONE, ALBANY

DRAFT

N

0 62.5 m
SCALE @ A3: 1:2500

9116-CON-02-A

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Appendix E – Gledhow SD220 Planning Overall District Plan with Landuse

574,500 575,000 575,500 576,000 576,500 577,000 577,500 578,000 578,500 579,000 579,500

6,127,000 6,126,500 6,126,000 6,125,500 6,125,000 6,124,500 6,124,000 6,123,500 6,123,000 6,122,500 6,122,000 6,121,500 6,121,000 6,120,500 6,120,000

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50 VERTICAL DATUM: AHD

FILE: J:\Mapping Tasks\South West\Wastewater\RIFM06613243_GreaterAlbanySewerDistrict_WWC\Working\Gledhow_SD220_Overall_landuse.mxd AUTHOR: DEMPSTGO

GLEDHOW SD220

GLEDHOW - SD220
Root Node at AC555 (SD259) is ROOT
Total catchment inflow = 116.3 L/sec
Total injected flow = 48.2 L/sec (SD218 and SD219)
Total outflow at root node = 164.5 L/sec

WWTP BUFFER

ALBANY SD220 - DN500 PM
LE GRANDE AVE PS8 - DN250 PM
GLEDHOW SD220 - DN500 PM
NEWTON ST PS2 - DN250 PM

'4534 - 221' SDF - 5.4 L/s
'4568 - 221' SDF - 1.4 L/s
'1834 - 221' SDF - 4.2 L/s
'1836 - 221' SDF - 1.1 L/s
'1823 - 221' SDF - 1.4 L/s
'1820 - 221' SDF - 4.0 L/s
'1824 - 221' SDF - 2.7 L/s
'1461 - 221' SDF - 0.2 L/s
'1828 - 221' SDF - 3.3 L/s
'1840 - 221' SDF - 5.0 L/s
'0849 - 221' SDF - 5.0 L/s
'0842 - 221' SDF - 5.4 L/s
'8E - 221' SDF - 4.2 L/s
'2245 - 221' SDF - 3.4 L/s
'81 - 221' SDF - 6.2 L/s
'2091 - 221' SDF - 3.1 L/s
'2901 - 221' SDF - 1.8 L/s
'0050 - 129' SDF - 3.0 L/s
'0050D - 129' SDF - 5.7 L/s
'0312 - 220' SDF - 4.7 L/s
'4715 - 220' SDF - 5.1 L/s
'3 - 220' SDF - 4.6 L/s
'34 - 220' SDF - 2.8 L/s
'0259 - 220' SDF - 4.9 L/s
'2613 - 129' SDF - 0.4 L/s
'0561 - 129' SDF - 6.3 L/s
'0044 - 129' SDF - 2.5 L/s
'1133 - 129' SDF - 0.8 L/s
'2672 - 129' SDF - 3.3 L/s
'4577 - 220' SDF - 3.5 L/s
'4870 - 220' SDF - 4.5 L/s
'0037 - 129' SDF - 3.8 L/s
'0254 - 129' SDF - 1.6 L/s
'V0366A - SDF - 7.8
'317 - 220' SDF - 1.5 L/s
'300 - 220' SDF - 8.0 L/s
'84 - 220' SDF - 6.8 L/s
'4582 - 220' SDF - 4.7 L/s
'64 - 220' SDF - 9.1 L/s
'60 - 220' SDF - 11.3 L/s
'30 - 220' SDF - 8.0 L/s
'56 - 220' SDF - 0.2 L/s
'4080 - 220' SDF - 5.5 L/s
'4083 - 220' SDF - 0.2 L/s
'2195 - 220' SDF - 1.6 L/s
'2399 - 129' SDF - 0.1 L/s
'P1 - 220' SDF - 3.4 L/s
'2002 - 220' SDF - 1.4 L/s
'75 - 220' SDF - 4.9 L/s
'74 - 220' SDF - 2.0 L/s
'82 - 220' SDF - 2.3 L/s
'5 - 220' SDF - 1.7 L/s
'14 - 219' SDF - 1.2 L/s

GLEDHOW P.S. B
PUMP STN. 'PSB - 220'
REDUCTION '4080 - 220'
SEWER DESIGN FLOW - 16.2 L/s
LONG TERM PUMP RATE - 21.6 L/s

GLEDHOW P.S. 2
NEWTON ST
PUMP STN. 'PS2 - 220'
REDUCTION '555 - 259'
SEWER DESIGN FLOW - 73.8 L/s
EXISTING PUMP RATE - 21.4 L/s
LONG TERM PUMP RATE - 189.3 L/s

GLEDHOW P.S. P
PUMP STN. 'PSP - 220'
REDUCTION '4080 - 220'
SEWER DESIGN FLOW - 6.4 L/s
LONG TERM PUMP RATE - 8.6 L/s

GLEDHOW P.S. A
PUMP STN. 'PSA - 220'
REDUCTION '4080 - 220'
SEWER DESIGN FLOW - 6.9 L/s
LONG TERM PUMP RATE - 13.2 L/s

GLEDHOW P.S. C
PUMP STN. 'PSC - 220'
REDUCTION '75 - 220'
SEWER DESIGN FLOW - 4.0 L/s
LONG TERM PUMP RATE - 6.0 L/s

WARRENUP P.S. 8A
LE GRANDE AVE MAIN PS
PUMP STN. 'PS8A - 221'
REDUCTION '555 - 259'
SEWER DESIGN FLOW - 62.8 L/s
LONG TERM PUMP RATE - 405.6 L/s

TEMP P.S.8
LE GRANDE AVE
TO BE GRADED OUT
EXISTING P.R. 45.1L/s

PUMP STN. 'PSL - 221'
WARRENUP PS L
REDUCTION '2090 - 221'
SEWER DESIGN FLOW
LONG TERM PUMP RATE - 6

LITTLE GROVE P.S. 30
O'CONNELL ST
PUMP STN. 'PS30 - 219'
REDUCTION '4080 - 220'
SEWER DESIGN FLOW - 22.4 L/s
EXISTING PUMP RATE - 29.8 L/s
LONG TERM PUMP RATE - 55.8 L/s

ALBANY REGIONAL PRISON
PRIVATE PUMP STATION
SDF: 9.0L/s

PS8 PS8A PSK PS10 PSL PRV 18 PRVBC PRVCP PSB PS2 PSP PSA PRV2

0 100 200 300 400 500 Metres

DATE	REVISION DESCRIPTION	DRN	APPD
XX/XX	XXXXXXXXXXXXXXXXXXXX	XX	XX

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LEGEND

- Existing Access Chamber
- Proposed Access Chamber
- Existing Vacuum Chamber
- Proposed Vacuum Chamber
- Existing Pump Station
- Proposed Pump Station
- Existing Gravity Sewer
- Proposed Gravity Sewer
- Existing Vacuum Sewer
- Proposed Vacuum Sewer
- Existing Pressure Main
- Proposed Pressure Main
- Node Catchment
- PS and Sewer Catchments
- Sewer District / WWTP Catchment
- Existing Sewered Areas
- Sewered By Private PS
- Parks and Public Open Space
- Bush Forever
- Floodway / Flood Fringe
- Flood Plain
- Cut / Fill

NOTATION

SEWER DISTRICT NUMBER
CATCHMENT NODE
CATCHMENT '7001 - 121'
R15 - 108.4 @75% (W)
'R' CODE ZONING
GROSS AREA (ha)
% OF LAND DEVELOPMENT
(W) - WET CONDITIONS
(D) - DRY CONDITIONS

SHEET INDEX

N

NEXUS No. 124490641
VERSION V2

WATER CORPORATION
ISSUED WITH THE AUTHORITY OF THE MANAGER ASSET PLANNING GROUP
629 NEWCASTLE STREET, LEEDERVILLE 6007 WESTERN AUSTRALIA.
TELEPHONE (08) 9420 2420, FAX (08) 9420 3179

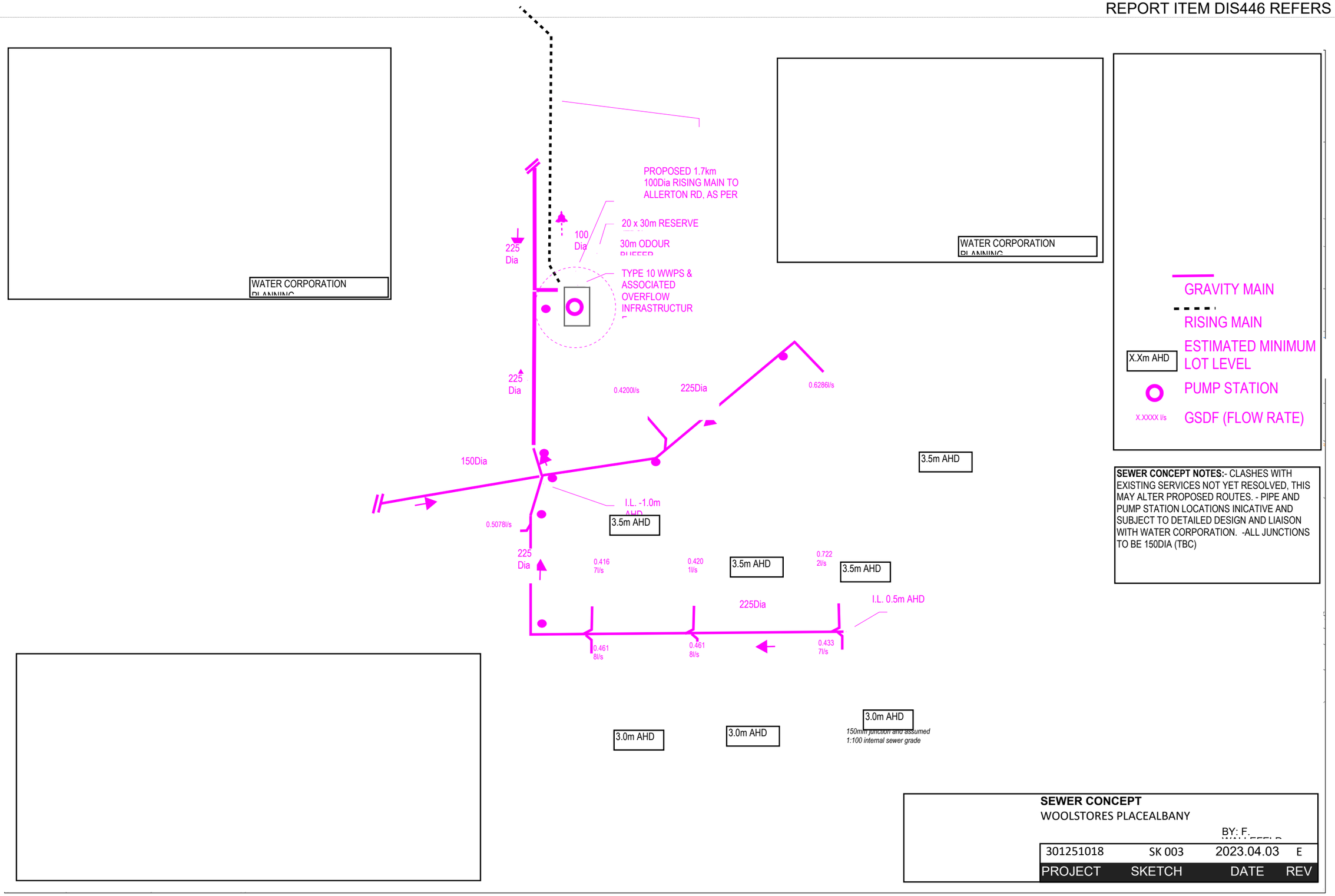
WASTEWATER SCHEME PLANNING SERIES

GLEDHOW - SD220

CONCEPTUAL PLANNING
LONG TERM SCHEME WITH LANDUSE

PLANNING BY	COMPILED BY	ACCEPTED BY	
APG PLANNERS	W. CALLANAN	C. DELPORT	
SCALE 1:10,000	FULL REVIEW NOVEMBER 2021	NEXUS FOLDER 59247668	A1

Appendix F – Schematic Sewer Concept Woolstores Place SK003D



DEVELOPMENT CONCEPT
VARIOUS LOTS, WOOLSTORES PLACE
MOUNT ELPHINSTONE, ALBANY

DRAFT

N

0 62.5 m
SCALE @ A3: 1:2500

9116-CON-02-A

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SURVEY: HARLEY DYKSTRA 23304-01A

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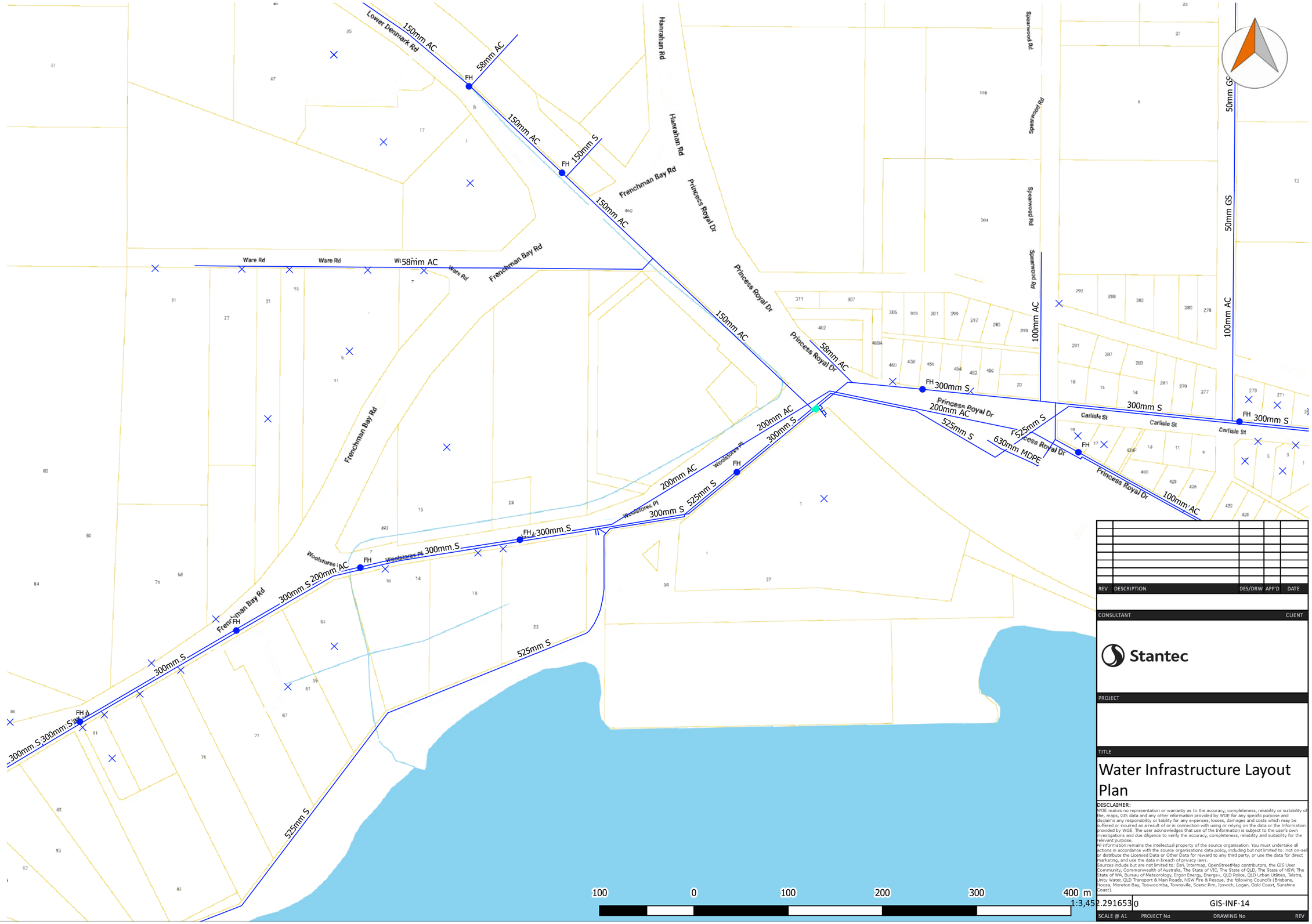
Appendix G – Woolstores Place Existig Waer Infrastructure



REV	DESCRIPTION	DES/DRW	APP'D	DATE

CONSULTANT

Stantec

CLIENT

PROJECT

TITLE

Water Infrastructure Layout Plan

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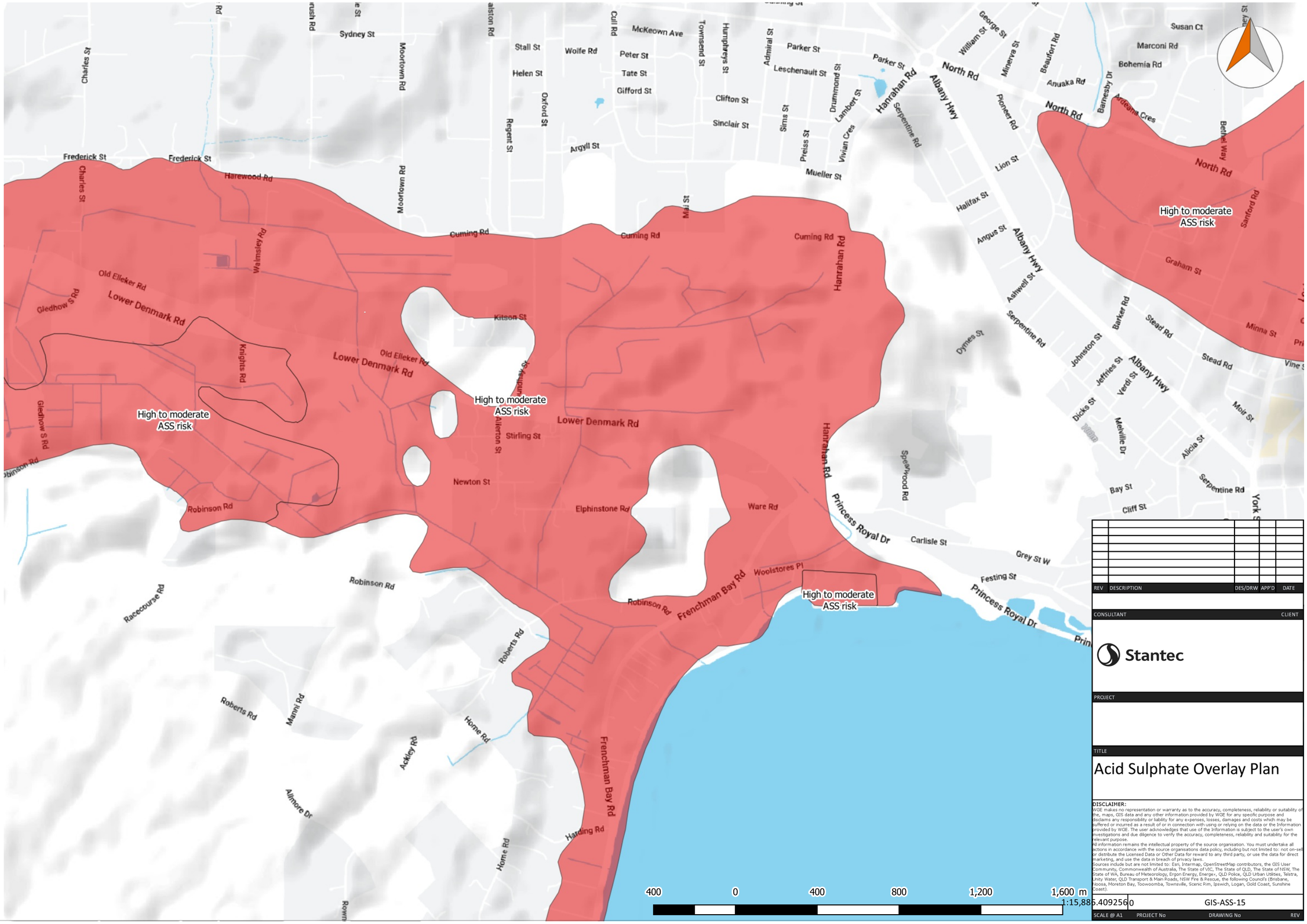
SCALE @ A1	PROJECT No	DRAWING No	REV
	0	GIS-INF-14	

Appendix H – Woolstores Place ASS Map



REV	DESCRIPTION	DES/DRW	APP'D	DATE

CONSULTANT: Stantec

CLIENT:

PROJECT:

TITLE: Acid Sulphate Overlay Plan

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SCALE @ A1	PROJECT No	DRAWING No	REV
	60	GIS-ASS-15	

Appendix I – Moreys Drain Advice

Wallefeld, Fred

From: Land Planning <LandPlanning@watercorporation.com.au>
Sent: Tuesday, 15 November 2022 9:08 AM
To: Wallefeld, Fred
Subject: RE: Water & Sewer services in Albany - Proposed redevelopment of Woolstores

Categories: Filed by Newforma

Good morning Fred,

Our drainage planners have advised that the piping and transfer of the Moreys Branch Drain to the City of Albany has been agreed in principle by the Corporation as part of the Albany Ring Road project. It makes logical sense to pipe and transfer this upstream section of open drain along Woolstores Place as you have proposed to tie all the change of ownership together with the ring road project.

The process of designing and constructing a suitable piped drain can be done through the Corporation's Development Services Networks Expansion Team either as part of the subdivision and development site works, or separately if required. The proponent/developer of this land will need liaise with the WC Great Southern Region Office and the City of Albany to co-ordinate the construction works and the transfer of the drains.

Regards

Brett Coombes
Senior Urban Planner
Development Services

From: Wallefeld, Fred <fred.wallefeld@stantec.com>
Sent: Monday, 14 November 2022 2:26 PM
To: Land Planning <LandPlanning@watercorporation.com.au>
Cc: Demeza, Travis <travis.demeza@stantec.com>; Li, Luxi <luxi.li@stantec.com>
Subject: RE: Water & Sewer services in Albany - Proposed redevelopment of Woolstores

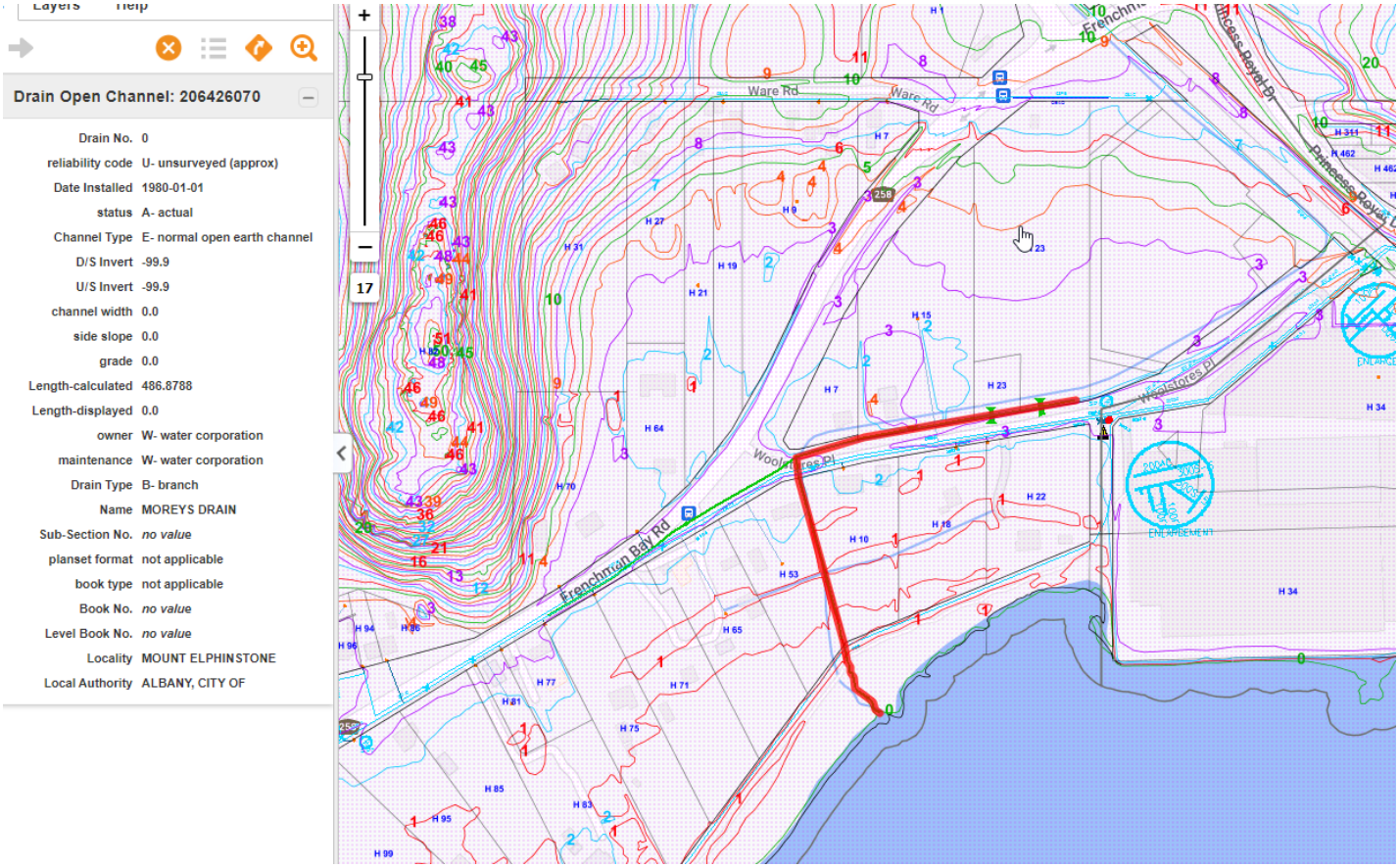
Hi Brett

Can I please add an additional enquiry onto the sewer enquiry already in progress?

Part of the existing open drain along Woolstores Place is listed as a Water Corporation drain, see image below. It is also shown on the City of Albany's asset database (attached).

We are proposing to close this open channel drain and replace with an appropriate sized stormwater pipe system, within the road reserve (as per conventional Local Authority pipe systems). Can you advise if this will be an issue? Or if any particular conditions will apply to the closure, replacement or relocation of this asset?

Regards, Fred



Fred Wallefeld
Civil Project Engineer, Albany

Direct: +61 8 6819 7214
Mobile: +61 407 081 570
fred.wallefeld@stantec.com

Stantec Australia Pty Ltd

Appendix J – ARR Stormwater Designs

MATCHLINE JOINS DRAWING 10218-JAC-312-DRA-DRG-02006

REFERENCE LINE MCR6

RAMP 6

BASIN 3Q

BASIN ACCESS TRACK

ALBANY RING ROAD

TYPE 'A' OUTLET

SUBSOIL DRAINAGE

OFFSET PIPE REQUIRES 1.8m BENCHED LINER

FRENCHMAN BAY ROAD

REFERENCE LINE MCH1

BASIN ACCESS TRACK

PIPE OFFSET FROM KERB TO PROVIDE HORIZONTAL CLEARANCE TO BRIDGE FOOTING

BASIN 3R

TYPE 'A' OUTLET

REFERENCE LINE MCS1

RAIL TRACK

LOWER DENMARK ROAD

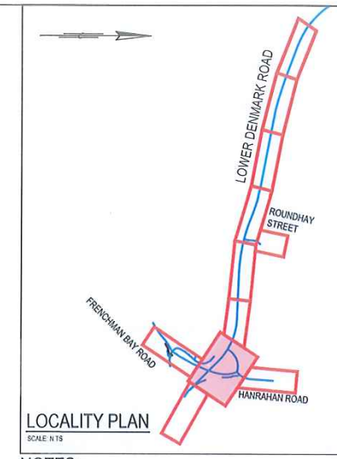
EXISTING

PROPOSED WATER SERVICE

MATCHLINE JOINS DRAWING 10218-JAC-312-DRA-DRG-02003

MATCHLINE JOINS DRAWING 10218-JAC-312-DRA-DRG-02005

MATCHLINE JOINS DRAWING 10218-JAC-312-DRA-DRG-02006



LOCALITY PLAN
SCALE: N.T.S

NOTES:

1. ALL ELEVATIONS ARE IN m AHD
2. ALL PIPE DIAMETERS ARE DIMENSIONED IN mm
3. REFER TO DRG. 10218-JAC-310-DRA-DRG-04001 TO 04006 FOR PIT AND CULVERT SCHEDULE.
4. REFER T0 DRG 10218-JAC-DRA-DRG-01002 FOR LIST OF MRWA DRAWINGS REQUIRED.
5. REFER TO DRAWINGS 10218-JAC-341-RD-DRG-02001 - 02006 AND 10218-JAC-342-RD-DRG-02001 - 02006 FOR KERB TYPE.
6. INVERT LEVELS MODELLED IN DRAINS / SWALES ARE FINAL SURFACE LEVELS INCLUSIVE OF TREATMENTS
7. REFER TO 10218-JAC-310-DRA-DRG-01002 FOR ADDITIONAL LEGEND ITEMS.

LEGEND

- SITE BOUNDARY
- NEW KERB
- NEW SEAL EDGE
- NEW DRAINAGE PIPE
- NEW TRANSVERSE CULVERT
- FLOW DIRECTION
- NEW END TREATMENT
- NEW MANHOLE
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- NEW BATTER SLOPE
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- EXISTING END TREATMENT
- EXISTING PIPES/STRUCTURES TO BE REMOVED OR SLURRY FILLED
- NEW CONTOURS MAJOR (0.5m)
- NEW CONTOURS MINOR (0.1m)
- EXISTING CONTOURS
- M2LAz-02 DRAINAGE STRUCTURE NO.

U/S INV 31.553 / 3000 / 0.44% / 15.005m / RCP 2 / D/S INV 31.373 — UPSTREAM INVERT / UPSTREAM INVERT / LENGTH / TYPE / DOWNSTREAM INVERT

DESIGN DRAINAGE PIPE INFORMATION

SCALE 1:1000 (A1) / 1:2000 (A3)

No	DESCRIPTION	APPROVED & DATE
	AMENDMENTS	
C	ISSUED FOR 100% DESIGN REVIEW	A.V.D.H 18/03/22
B	ISSUED FOR 85% DESIGN REVIEW	A.VDH 06/12/21
A	ISSUED FOR 15% DESIGN REVIEW	A.VDH 20/08/21

METADATA	
GROUND SURVEY STANDARD:	67-08-43
DATE OF CAPTURE:	02-03/2018
MAPPING SURVEY STANDARD:	67-08-44
DATE OF CAPTURE:	04/2018
MAIN ROADS PROJECT ZONE:	ALB 94
HEIGHT DATUM:	AHD 71

Jacobs
Challenging today.
Reinventing tomorrow.

DRAWN	H.BURWOOD	12/21
DESIGNED	D. MEYER	12/21
CHECKED		
APPROVED	A. V.D.HEYDEN	06/12/21

KBR — VERIFIED — DATE

DECMIL — DESIGN MANAGER — DATE — PROJECT DIRECTOR — DATE

THE GOVERNMENT OF WESTERN AUSTRALIA
mainroads WESTERN AUSTRALIA
INFRASTRUCTURE DELIVERY DIRECTORATE

CONTRACT MANAGER — DATE — PROJECT DIRECTOR — DATE

LOCAL AUTHORITY: (302) CITY OF ALBANY
MAIN ROADS RESPONSIBILITY AREA: GREAT SOUTHERN REGION
MRWA DRAWING NUMBER:
PROJECT TITLE: ALBANY RING ROAD (H054)
DRAWING TITLE: SP3-2 CHAINAGE 13500 TO CHAINAGE 17600 LOT 312 - DRAINAGE GENERAL ARRANGEMENT SHEET 4 OF 6
SHEET: A1
DRAWING STATUS: 100% DESIGN
DRAWING NO.: 10218-JAC-312-DRA-DRG-02004
REV: C

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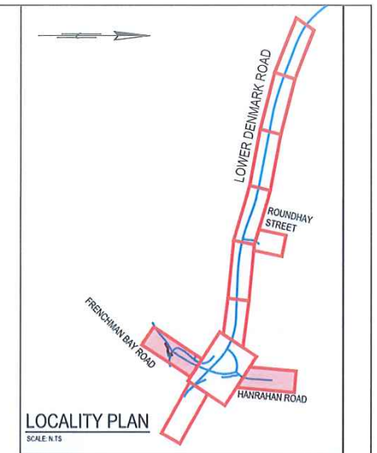
REFERENCE LINE MCD1
FRENCHMAN BAY ROAD
EXISTING
BASIN ACCESS TRACK
INSTALL NEW HEADWALL ON EXISTING DRAINAGE NETWORK
PROPOSED WATER SERVICE
REFERENCE LINE MCF1
LOWER DENMARK ROAD
WARE ROAD
BASIN 3T
BASIN 3S
TYPE 'A' OUTLET
BASIN ACCESS TRACK
FRENCHMAN BAY ROAD
REFERENCE LINE MCH1
REFERENCE LINE MCW2
WOOLSTORES PLACE
MATCHLINE JOINS DRAWING 10218-JAC-312-DRA-DRG-02004



LOCALITY PLAN
SCALE: N.T.S

MATCHLINE JOINS DRAWING 10218-JAC-312-DRA-DRG-02004
CONSTRUCTION BY OTHERS
TEMPORARY CULVERT REQUIRED IF CSBP DRIVEWAY IS NOT CONSTRUCTED
HANRAHAN ROAD
REFERENCE LINE MCH1

NOTES:

1. ALL ELEVATIONS ARE IN m AHD
2. ALL PIPE DIAMETERS ARE DIMENSIONED IN mm
3. REFER TO DRG. 10218-JAC-310-DRA-DRG-04001 TO 04006 FOR PIT AND CULVERT SCHEDULE.
4. REFER TO DRG 10218-JAC-DRA-DRG-01002 FOR LIST OF MRWA DRAWINGS REQUIRED.
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6. INVERT LEVELS MODELLED IN DRAINS / SWALES ARE FINAL SURFACE LEVELS INCLUSIVE OF TREATMENTS
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- SITE BOUNDARY
- NEW KERB
- NEW SEAL EDGE
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U/S INV 31.553 / 2000 / 0.44% / 41.005m / RCP 2 / D/S INV 31.373 — UPSTREAM INVERT / UPSTREAM INVERT LENGTH / TYPE / DOWNSTREAM INVERT — DESIGN DRAINAGE PIPE INFORMATION

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MAPPING SURVEY STANDARD:	67-08-44
DATE OF CAPTURE:	04/2018
MAIN ROADS PROJECT ZONE:	ALB 94
HEIGHT DATUM:	AHD 71

Jacobs
Challenging today. Reinventing tomorrow.

DRAWN	M.BURWOOD	12/21
DESIGNED	D. MEYER	12/21
CHECKED		
APPROVED	A. V.D.HEYDEN	06/12/21
VERIFIED		DATE

KBR
DECMIL
INFRASTRUCTURE DELIVERY DIRECTORATE
mainroads WESTERN AUSTRALIA

DESIGN MANAGER DATE
PROJECT DIRECTOR DATE
CONTRACT MANAGER DATE
PROJECT DIRECTOR DATE

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MAIN ROADS RESPONSIBILITY AREA: GREAT SOUTHERN REGION
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SHEET: A1
DRAWING STATUS: 100% DESIGN
DRAWING NO.: 10218-JAC-312-DRA-DRG-02006
REV: C

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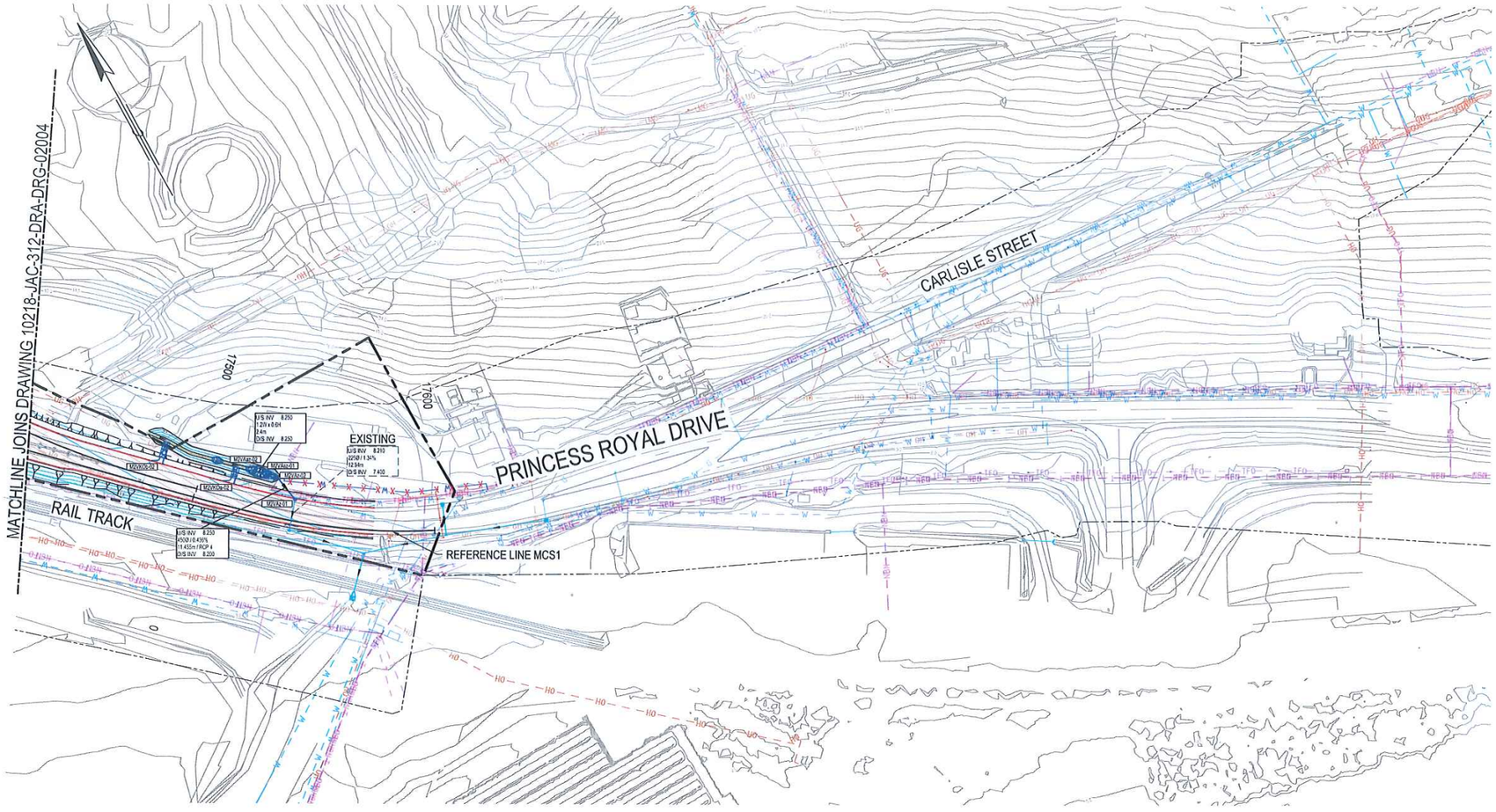
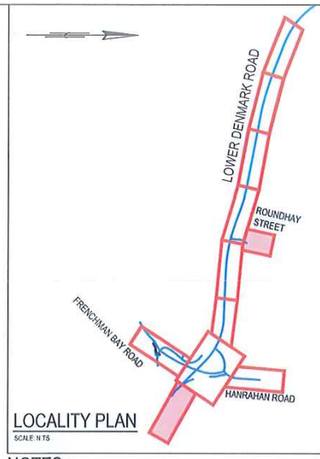


PLAN
SCALE
1:1000



LOCALITY PLAN
SCALE: N.T.S

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U/S INV 31.553
300/12.44%
41.655m RCP 2
D/S INV 31.373
UPSTREAM INVERT
UPSTREAM INVERT
LENGTH / TYPE
DOWNSTREAM INVERT
DESIGN DRAINAGE PIPE INFORMATION

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AMENDMENTS

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MAPPING SURVEY STANDARD:	67-08-44
DATE OF CAPTURE:	04/2018
MAIN ROADS PROJECT ZONE:	ALB 94
HEIGHT DATUM:	AHD 71

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DRAWN	M.BURWOOD	12/21
DESIGNED	D. MEYER	12/21
CHECKED		
APPROVED	A. V.D.HEYDEN	06/12/21

VERIFIED DATE

DESIGN MANAGER DATE
PROJECT DIRECTOR DATE

CONTRACT MANAGER DATE
PROJECT DIRECTOR DATE

INFRASTRUCTURE DELIVERY DIRECTORATE

LOCAL AUTHORITY: (302) CITY OF ALBANY
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MRWA DRAWING NUMBER:
PROJECT TITLE: ALBANY RING ROAD (H054)
DRAWING TITLE: SP3-2 CHAINAGE 13500 TO CHAINAGE 17600
LOT 312 - DRAINAGE
GENERAL ARRANGEMENT
SHEET 5 OF 6
SHEET: A1
DRAWING STATUS: 100% DESIGN
DRAWING No.: 10218-JAC-312-DRA-DRG-02005
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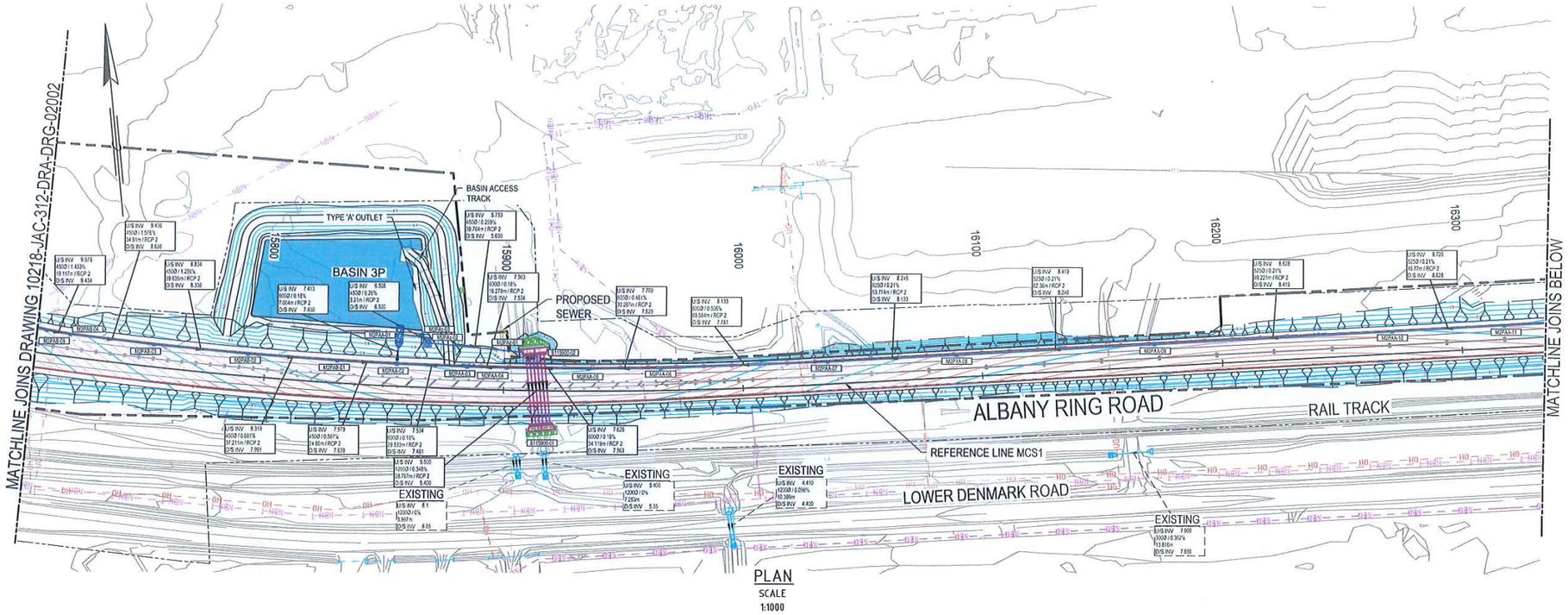

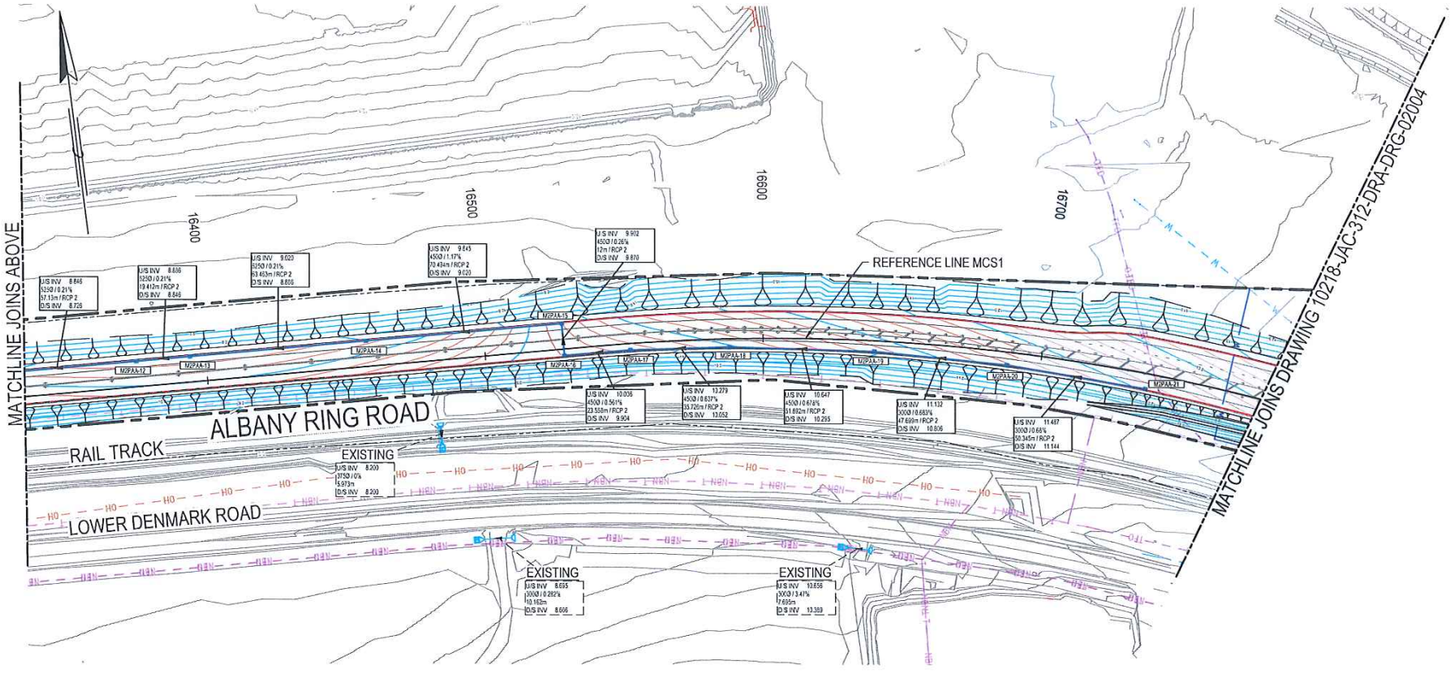

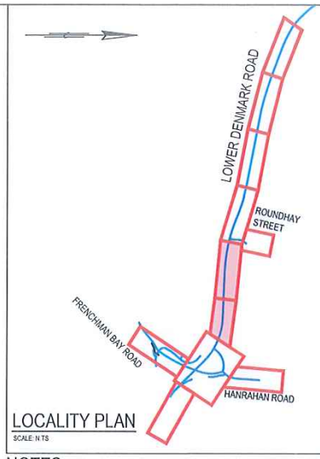

LOCALITY PLAN
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PROJECT DIRECTOR DATE

mainroads WESTERN AUSTRALIA

LOCAL AUTHORITY: (302) CITY OF ALBANY
MAIN ROADS RESPONSIBILITY AREA: GREAT SOUTHERN REGION
MRWA DRAWING MANAGER

PROJECT TITLE: ALBANY RING ROAD (H054)
DRAWING TITLE: SP3-2 CHAINAGE 13500 TO CHAINAGE 17600
LOT 312 - DRAINAGE
GENERAL ARRANGEMENT
SHEET 3 OF 6
SHEET: A1
DRAWING STATUS: 100% DESIGN
DRAWING No.: 10218-JAC-312-DRA-DRG-02003
REV: C

Plot Date : 22 Mar 2022, 2:12pm FILENAME - C:\Users\burwoom\appdata\local\projectwise\jacobs_amz_ie\405616\10\10218-JAC-312-DRA-DRG-02001 TO 02006.dwg

Stantec Australia Pty Ltd
PO Box 634,
Level 1, The Terrace Centre, 96 - 102 Stirling Terrace
Albany WA 6330
Tel 9842 3700

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stantec.com/au

‘Commercial in Confidence’

Rowe Group

Preliminary Site Investigation

Woolstores Place
Western Australia

27 February 2023

63117/ 145,568 (Rev B)

www.jbsg.com.au

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Executive Summary

JBS&G Australia Pty Ltd, was commissioned by Rowe Group (the client) to undertake a Preliminary Site Investigation (PSI) for the ten (10) Lot parcel of land at Woolstores Place (the site). The site includes ten cadastral lots as detailed in Table 1-1. The site location and layout are presented in **Figure 1** and **Figure 2** respectively.

The objective of the project was to undertake a PSI, to assess the nature of current and or historical potentially contaminating activities that may have previously occurred within the site or on adjacent properties.

The following scope of works was completed in order to meet the project objectives.

- Completion of a site inspection to identify potentially contaminating activities including but not limited to the observation of the following:
  - Location and condition of visible features including foundations, tanks, pits, wells and bores.
  - Chemical storage and transfer areas, including the presence of waste or chemical containers.
  - Suspect or known hazardous building materials in site structures.
  - Assessment of areas fly tipping/ waste disposal.
  - Observations of obvious evidence of hazardous materials/ conditions (evidence of surface staining, pits, ponding, stressed vegetation, etc.).
- Completion of a desktop review of available client provided and publicly available information including, but not limited to:
  - Local topography, geology, hydrology, hydrogeology and meteorological data (i.e. environmental setting).
  - Historical aerial photographs, including a review of previous and current site activities.
  - Current and historical land title search, including a review of the historical owners and occupiers of the site.
  - Drainage at the site.
  - Readily available government/council records.
  - Any dangerous goods records from the DMIRS.
  - DWER records on the contamination classification of the site
- Preparation of an interpretative PSI report (this report) including a Conceptual Site Model (CSM), in general conformance with the WA DWER Contaminated Sites Guidelines (2021), National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013[1] (NEPM), relevant Australian Standards (e.g., AS4482.1, AS4482.2) and industry standards.

The key findings of the PSI are as follows:

[1] National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013 published by the National Environment Protection Council (NEPC 2013) (NEPM)

Former Site Structures and Stockpiled Soil

The site investigation included an assessment for Potentially Asbestos Containing Material (PACM) associated with demolition and dilapidation of former site structures and stockpiled soils. Fragments of PACM were observed at multiple locations during the site inspection. The presence of PACM fragments presents a potentially unacceptable health risk to future residents and construction workers, as well as an aesthetic risk. The potential for fibre generation during civil works also poses a risk to on-site receptors.

Stockpiled soil was also present throughout the site. Stockpiled soil on the Woolstores lots was observed to contain a combination of building rubble, sheet metal, steel and PACM.

Illegal Dumping/ Fly Tipping

Along the eastern portion of the Woolstores lots, illegal dumping/ fly tipping was observed. Fragments of PACM were observed at multiple locations during the site inspection. The presence of PACM fragments and other COPCs associated with fly tipping (metal pipes, steel framework, sheet metal, concrete, paint tins, bricks, tyres etc.) presents a potentially unacceptable health risk to future residents and construction workers, as well as an aesthetic risk.

Potential Uncontrolled Fill

The Woolstores site has been built on reclaimed land. There is a potential risk associated with the unknown nature and extent of the imported material. During the preliminary site investigation, PACM fragments were observed within the fill material that was used to create site levels as they are today. The uncontrolled fill presents a potentially unacceptable health risk to future residents and construction workers, as well as an aesthetic risk.

At the time of inspection, a limestone road base had been imported to assist with site levels off-site. The limestone road base originated from virgin quarry material[2]. As the material has been directly sourced from a quarry, the potential for contamination from this material to migrate on-site is considered negligible. It should be noted that the imported limestone clean fill is off-site as the site boundary has changed.

Historical Land Uses

The Woolstores site has been subject to commercial/ industrial land uses for roughly 70 years. There is potential for site wide contamination associated with these historical potentially contaminating activities to exist. The Woolstores site while operational was used as a wool storage facility with truck and machinery access. During the PSI, soak wells were observed but the linings were unable to be visually assessed. Further assessment to determine whether the soak wells are lined or unlined is required. Most of the site is also unsealed creating a potential pathway for contaminants from onsite activities to leach through the soil profile to impact groundwater.

Migration of potentially contaminated groundwater from up-gradient properties

Table 3.3 identified various up-gradient properties that are impacted by contaminated groundwater. Based on the information reviewed, it is possible that these impacts have migrated on-site. General regional groundwater quality is known to be acidic. As future land uses on-site are proposed to be a combination of residential and mixed commercial uses, there is a risk that site receptors may come into contact with this contaminated groundwater if abstracted for use. Groundwater in the local area is also relatively shallow (<2m bgl).

[2] Mainroads Western Australia – Great Sothern Region – ARR Material Summary, Armstrong's Gravel Pit, Main Roads Limestone Pit.

Acid Sulfate Soils

The DWER (2015) guidance states that in areas of 'High to Moderate risk' of ASS occurring, an ASS investigation is required prior to the following ground disturbance activities:

- Earthworks that will disturb more than 100 m^3 of soil.
- During dewatering or soil draining activity.

Given the site's aim is for re-zoning to a residential land use it is likely that both the ground disturbance events above will occur. This will, therefore, trigger the requirements for ASS investigation.

Recommendations

Based on the investigation conclusions, the following recommendations are made.

Further assessment or management/remediation of the potentially impacted soils and groundwater should be considered to assess the potential risks to future site receptors. It is noted that an intrusive sampling program should be considered to characterise impacts associated with the APECs identified.

It is recommended that JBS&G provide a scope for a Sampling Analysis and Quality Plan (SAQP) and subsequent Detailed Site Investigation (DSI) in order to characterise the nature, extent and risk of potential contamination onsite (site derived and offsite migration).

It is recommended that waste material identified on site, derived from the illegal dumping/fly tipping activity is removed and disposed of off-site appropriately at the time of demolition, prior to the completion of further investigative activities.

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1. Introduction

1.1 Background

JBS&G Australia Pty Ltd, was commissioned by Rowe Group (the client) to undertake a Preliminary Site Investigation (PSI) for the ten (10) Lot parcel of land at Woolstores Place (the site). The site includes ten cadastral lots as detailed in Table 1-1 below. The site location and layout are presented in **Figure 1** and **Figure 2** respectively.

Table 1-1: Site Lot Details

Lot address	Certificate of title	Lot area (ha)
34 Woolstores Place	Lot 1104 on Deposited Plan 165964	2.00
34 Woolstores Place	Lot 1209 on Deposited Plan 173935	3.36
34 Woolstores Place	Lot 895 on Deposited Plan 161301	4.05
34 Woolstores Place	Lot 1350 on Deposited Plan 184224	0.43
N/A	Lot 1156 on Deposited Plan 171141	0.20
N/A	Lot 1157 on Deposited Plan 171141	2.25
23 Woolstores Place	Lot 141 on Deposited Plan 27076	0.20
23 Woolstores Place	Lot 140 on Deposited Plan 27076	2.40
15 Woolstores Place	Lot 11 on Diagram 53535	1.90
N/A	Lot 44 on Deposited Plan 171141	0.30

1.2 Objectives

The objective of the project was to undertake a PSI, to assess the nature of current and/ or historical potentially contaminating activities that may have previously occurred within the site or on adjacent properties.

A conclusion will be provided as to whether there may be potential for site contamination to exist, and if so, what further site assessment/investigation is required to establish the suitability of the site for a residential land use or what remedial action is required to manage/mitigate any unacceptable risks.

1.3 Scope

The following scope of works was completed in order to meet the project objectives.

- Completion of a site inspection to identify potentially contaminating activities including but not limited to the observation of the following:
  - Location and condition of visible features including foundations, tanks, pits, wells and bores.
  - Chemical storage and transfer areas, including the presence of waste or chemical containers.
  - Suspect or known hazardous building materials in site structures.
  - Assessment of areas fly tipping/ waste disposal.
  - Observations of obvious evidence of hazardous materials/ conditions (evidence of surface staining, pits, ponding, stressed vegetation, etc.).
- Completion of a desktop review of available client provided and publicly available information including, but not limited to:

- Local topography, geology, hydrology, hydrogeology and meteorological data (i.e. environmental setting).
- Historical aerial photographs, including a review of previous and current site activities.
- Current and historical land title search, including a review of the historical owners and occupiers of the site.
- Drainage at the site.
- Readily available government/council records.
- Any dangerous goods records from the DMIRS.
- DWER records on the contamination classification of the site

- Preparation of an interpretative PSI report (this report) including a Conceptual Site Model (CSM), in general conformance with the WA DWER Contaminated Sites Guidelines (2021), National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013[3] (NEPM), relevant Australian Standards (e.g., AS4482.1, AS4482.2) and industry standards.

[3] National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013 published by the National Environment Protection Council (NEPC 2013) (NEPM)

2. Site Condition and Surrounding Land Use

2.1 Site Identification

The location of the site is shown in Figure 1 and the layout of the site is shown in Figure 2. Site identification details are summarised in Table 2-1 and described in the following sections. The Certificate of Title for each of the individual Lots is provided in Appendix E.

Table 2-1: Site Details

Site Address & Lot ID	34 Woolstores Place (Lot 1104 on Deposited Plan 165964) 34 Woolstores Place (Lot 1209 on Deposited Plan 173935) 34 Woolstores Place (Lot 895 on Deposited Plan 161301) 34 Woolstores Place (Lot 1350 on Deposited Plan 184224) 23 Woolstores Place (Lot 141 on Deposited Plan 27076) 23 Woolstores Place (Lot 140 on Deposited Plan 27076) 15 Woolstores Place (Lot 11 on Diagram 53535) N/A (Lot 1156 on Deposited Plan 171141) N/A (Lot 1157 on Deposited Plan 171141) N/A (Lot 44 on Deposited Plan 171141)
Approximate Coordinates of Estate Boundary (UTM)	N Corner = -35.023117, 117.859034
	E Corner = -35.026987, 117.867681
	W Corner = -35.026381, 117.856086
	S Corner = -35.027743, 117.856934
Site Area (ha)	19.66
Site Owner(s)	Mainbeam PTY LTD – Lot 1156, Lot 1157, Lot 895, Lot 1104, Lot 1209, Lot 140, Lot 141 Main Roads Western Australia – Lot 11 State of Western Australia – Lot 44 City of Albany – Lot 1350
Site Operator	Sandhurst Trustees LTD, Department of Planning, Lands and Heritage, Public Transport Authority of Western Australia
Current Land Use	Rural residential and commercial purposes. Parking and protection of public utility services.
Former Land Use	Rural residential properties, and Commercial Warehouse
Proposed Land Use	Residential land use (medium and high-density housing) with commercial land uses
Local Government Authority	City of Albany
Zoning	Rural (Small Lot Holdings), General Industry and Park and Recreation
Proposed Zoning	Mixed Use – Residential and Commercial Spaces
Site Classification	Currently not classified

2.2 Site Inspection

On 4-5th July 2022, an experienced JBS&G environmental scientist undertook a site inspection as part of the PSI (2022). The observations made have been separated into two tables. Table 2.2 summarises the site inspection findings for the undeveloped northern rural properties and summaries for the large commercial warehouses present are summarised in Table 2.3 below. Key site observations are presented in the photographs included in Appendix B.

Table 2-2: Site Inspection Findings Summary – Northern Rural Properties[4]

Aspect	Observations
Accessibility	Access to these lots is Woolstores Place, there is a main driveway that allows access to each of the residential properties. At the time of inspection, the Northern Rural Residential Properties remained undeveloped, although clean limestone roadbase has been imported to the north of the site for construction activities and assisting in site levels.
Topography	The lots are generally flat, with a progressive slope to the south toward Lockyer Bay. Ground levels as depicted on Landgate range from 1 – 2 m AHD. There are surface water expressions present.
Surface drainage	All soils on site comprise of permeable sand, therefore most of the drainage onsite will be through infiltration.
Site nature and condition	Most of the site has been undeveloped. There is remnant vegetation present.
Visible signs of contamination	There were no notable visible signs of contamination.
On-site buildings and other infrastructure	The whole site did not contain infrastructure. The only buildings and other infrastructure that were present onsite at the time of inspection was the demountable dongas for the civil works being undertaken to the north (off-site).
Aesthetic issues	No odours or visual signs of contamination were detected, and general housekeeping was appropriate.
Stockpiled material	There was a large stockpile of material located to the north (off-site), most likely associated with the topsoil scrape of the site before the fill was imported. The extent of the material is estimated to be circa 765m^3. As this material was located off-site, no further assessment was undertaken.
Presence of PACM	No PACM was observed
Groundwater bores	No groundwater bores were observed
Surrounding land use	The surrounding land is used for rural residential, general industry and parks and recreation purposes.

Table 2-3: Site Inspection Findings Summary – Commercial/ Industrial Warehouses[5]

Aspect	Observations
Accessibility	Access to these lots is Woolstores Place, there is a main driveway that allows access the lots. The boundary of the lots is bounded by temporary fencing.
Topography	The lots are generally flat, with a progressive slope to the south toward Lockyer Bay. Ground levels range from 1 – 2 m AHD.
Surface drainage	All soils on site comprise of permeable sand, therefore most of the drainage onsite will be through infiltration. There were various drains and sumps present on site.
Site nature and condition	At the time of inspection, the warehouse located on Lot 895 had been partially demolished with all roofing and wall structures removed. The warehouse to the south is still in good condition with only roughly 10% of roofing panels removed.
Visible signs of contamination	No gross contamination was observed. Fugitive PACM fragments were found around the warehouses and within the imported fill material along the southern and eastern boundary of the site.
On-site buildings and other infrastructure	Two historical warehouses associated with the historical Woolstores operations were present at the time of inspection. Both were in the process of being demolished. Roofing panels on both buildings comprised predominantly of PACM.
Aesthetic issues	No odours were detected, however, at the time of inspection the site was covered in demolition material from the warehouses.
Stockpiled material	Stockpiled material was present throughout site with C & D waste with PACM scattered throughout the site
Presence of PACM	PACM fibre-cement sheeting observed around the warehouses and within the imported fill material along the southern and eastern boundary of the site.
Groundwater bores	Three groundwater bores were observed around the boundary of the site.

[4] Northern Rural Properties – Lot 141 on DP 27076, Lot 140 on DP 27076, Lot 11 on D 53535, Lot 1157 on DP 171141, Lot 44 on DP 171141.

[5] Lot 1104 on DP 165964, Lot 1209 on DP 173935, Lot 895 on DP 161301, Lot 1350 on DP 184224.

Aspect	Observations
Surrounding land use	The surrounding land is used for residential, public open space and mixed purposes

2.3 Surrounding Land Use

Under the Albany Local Panning Scheme 1, the site is bordered by Urban Residential and General Industry. The surrounding land uses are depicted in Figure 1.

Further details on the surrounding land use are presented in Table 2-5.

Table 2-4: Surrounding Land Use

Location	Detail
North	The site is bounded by a priority road (Frenchman Bay Road) and a railway. Further to the northeast is remnant bushland zoned as parks and recreation. Northwest of the site is zoned as rural with small lot holdings.
East	Directly east of the site is the rail line and Princess Royal Drive (Major Road). There are residential dwellings further east
South	The site is bound by Frenchman Bay to the south.
West	Land to the west is zoned as Tourist/ Residential with various tourist accommodation and residential dwellings.

3. Desktop Study

3.1 Environmental Setting

3.1.1 Topography

Review of available online topographic maps indicated that site lies at approximately 5 – 11 m Australian Height Datum (AHD).

During the site inspection, the site was observed to be typically flat, with minor surface depressions towards surface drainage infrastructure.

3.1.2 Hydrology

The site is situated within the Bremer West Aquifer. There is one permanent surface water bodies on site, this is located on Lot 11 on Diagram 53535. Shoal Bay located immediately south of Lot 1209 on Deposited Plan 173935.

3.1.3 Hydrogeology

According to data published by the DWER in the Perth Groundwater Atlas (PGA), the site is underlain by the Bremer West Superficial Sediment Aquifer.

Given the site's proximity to the coast, groundwater levels range from approximately 7.5 metres below ground level (mbgl) to less than 1 mbgl. Groundwater flow direction within the site broadly flows southward, toward the coast.

Groundwater quality in the area is noted to be from fresh to saline, with approximate total dissolved solid (TDS) measurements between 100 – 100,000 mg/L. The site does not fall within a Public Drinking Water Source Areas (PDWSA), with the closest PDWSA being approximately 1km west of the site.

3.1.3.1 Groundwater Bore Search

A review of the Department of Water and Environmental Regulation (DWER) Water Register indicates that there are 0 licensed[6] groundwater abstraction bores located within a 1.0 km radius of the site. The closest abstraction bore is located approximately 1.2km west of the site.

There are 10 registered bores within 500 m of the site (Appendix C), all of which are located within the boundary of the site. The details of the bores registered within the boundary of the site is summarised in Table 3-1 below. It is recognised that in WA in most instances there is no requirement to obtain a license for a domestic groundwater bore.

Table 3-1: Onsite Registered Groundwater Bore Details (DWER)

Licence #	Drill Depth (m bgl)	Bore Use	Direction and distance from centre of site	Additional information
60210190	4 m bgl	Groundwater bore	310 m south west	Department of Water
60210191	4 m bgl	Groundwater bore	320 m south west	Department of Water
60210112	5.5 m bgl	Groundwater bore	300 m north east	Department of Water
60210113	9.8 m bgl	Groundwater bore	300 m north east	Department of Water
60210114	15.2 m bgl	Groundwater bore	300 m north east	Department of Water

[6] There is a requirement to obtain a groundwater abstraction licence where groundwater is used for commercial/industrial purposes (e.g. process water), especially if abstraction is occurring from deeper confined aquifers. There may be additional unregistered groundwater wells in the area.

Licence #	Drill Depth (m bgl)	Bore Use	Direction and distance from centre of site	Additional information
60210115	4 m bgl	Groundwater bore	In Centre of Site	Department of Water
60210116	8.3m bgl	Groundwater bore	In Centre of Site	Department of Water
60210117	11.2 bgl	Groundwater bore	In Centre of Site	Department of Water
60210118	14.3 m bgl	Groundwater bore	In Centre of Site	Department of Water
60210411	15.2 m bgl	Groundwater bore	350 m north west	CSBP

3.1.4 Geology

The site is located within the Albany-Fraser Orogen Nornalup Complex range formation, comprising of gneiss, metamorphic rock and granitoid.
Porphyritic biotite granite and adamellite and a quartz-feldspar-biote gneiss; compositionally layered gneiss with granofels; includes amphibolite and mafic granulite layers; granoblastic fabric.

3.1.4.1 Acid Sulfate Soils

Acid sulfate soils (ASS) are naturally occurring, iron-sulfide rich soils, sediments, or organic substrates, formed under waterlogged conditions. If exposed to air, these sulfides can oxidise and release sulfuric acid and heavy metals. This process can occur due to drainage, dewatering or excavation.

The ASS risk mapping available from the Australian Soil Resource Information System (ASRIS) (2013) and DWER (2017). The site is classed as having a 'High Probability of Occurrence' (ASRIS 2013) and/or 'High to Moderate risk' (DWER 2017) of ASS occurring within 3 m of the natural soil surface that could be disturbed by most land development activities. The DWER (2015) guidance states that in areas of 'High to Moderate risk' of ASS occurring, an ASS investigation is required prior to the following ground disturbance events:

- Earthworks that will disturb more than 100 m^3 of soil.
- During dewatering or soil draining activity.

3.2 Site History

3.2.1 Current land use

The Woolstores lots are currently zoned General Industry with the surrounding lots zoned as Rural residential under the City of Albany's Local Planning Strategy (2019).

Based on information obtained in the site inspection and desktop study, the current land use is considered to comprise of:

- **Lot 1104** – Commercial / industrial property. The western half of the lot is covered in a warehouse structure while the eastern half is covered in vegetation with a dirt path running north to south.
- **Lot 1209**– Commercial / industrial property. The whole lot is covered in a warehouse structure.
- **Lot 895**- Commercial / industrial property. The northern portion of the lot is split into two warehouses with the southern portion warehouse being part of lot 1209s warehouse. The southern portion of the lot is vegetated.
- **Lot 1350**– Site comprises of vegetated land.
- **Lot 1156**– Site comprises of vegetated land.
- **Lot 1157**– Site comprises of vegetated land.

- **Lot 140** - Site comprises of vegetated land. At the southern portion of the lot there is a residential driveway built.
- **Lot 141** - Rural residential with a small scale workshop and associated laydown area in the northern portion of the site. The remainder of the site vegetated.
- **Lot 11** – Rural residential at the southern portion of the lot. The remainder of the lot is vegetated with a surface water body present in the south.
- **Lot 44**– Site comprises of vegetated land.

3.2.2 Historical land use

Historical aerial photographs have been reviewed in order to gain an understanding of the historical use of the site, and to identify areas and activities of potential environmental concern with respect to contamination. A summary of the available aerial images from Landgate 'Map Viewer Plus' were reviewed as part of the investigation and are summarised in Table 3-2.

Table 3-2: Summary of Historical Aerial Photograph Observations

Date	General Observation	Lot Specific Observations
1954	• First available photograph, Woolstores place seems to be a sealed road. • The surrounding land remains mainly uncleared.	• All lots remain uncleared with the exception of Lot 895 which contains a commercial/industrial building.
1961	• Remains largely unchanged from previous photo. • The surrounding land remains mainly uncleared.	• Lot 895 had expanded its commercial/industrial building into Lot 1104.
1977	• Land within the lots has been cleared for agricultural purposes. • Surrounding land continues with residential development to the west, and industrial/commercial development to the north.	• The expansion of the commercial/industrial building on Lot 895 has continued and now occupies Lot 895, Lot 1104 and Lot 1209. • Lot 1209 has been filled to reclaim land for the warehouses to be built on. • Lot 140 further development of residential property at northern part of the lot.
1988	• Remains largely unchanged from previous photograph. • Commercial/industrial development continues to the north and east of the lots.	• Remains largely unchanged from previous photograph. • A surface water body has appeared on Lot 140
1996	• Remains largely unchanged from previous photograph. • Commercial/industrial development continues to the north and east of the lots.	• Residential building developed on Lot 11.
2007	• Remains largely unchanged from previous photograph. • Commercial/industrial development continues to the north of the lots.	• The commercial/industrial building that crosses over Lot 895 and Lot 1104 has been demolished.
2012	• Remains largely unchanged from previous photograph.	• Remains largely unchanged from previous photograph.
2018	• Remains largely unchanged from previous photograph. • Commercial/industrial development continues to the north of the lots.	• Lot 140 has developed a dam like structure along the eastern border of the lot. • Surface water bodies are present in Lot 141.
2020	• Remains largely unchanged from previous photograph.	• Remains largely unchanged from previous photograph.

3.3 Dangerous Goods Search

A dangerous goods license search request was completed on 20th May 2022 with the WA Government Department of Mines, Industry Regulation and Safety (DMIRS) for each of the site Lots. The Notice of Decision provided by DMIRS found various documents pertaining to the storage of Dangerous Goods onsite dating from 1993 – 2002. The response provided by DMIRS is included in Appendix D. The dangerous goods documents for the site related to the storage of a 3.8 KL Liquid

Petroleum Gas Tank from 1993 to 2002. The latest correspondence with DMIRS in relation to the storage of the tank was in 2002. The letter stated, *"The Albany Woolstores are no longer in operation and the gas tank has been removed."*

3.4 DWER Records

3.4.1 Site Records

A BSR Request was submitted to DWER for each of the Lots on 20/05/2022. A search of the department's records indicate that the site has not been reported to the department as a known or suspected contaminated site.

The BSR search responses are provided in Appendix E.

3.4.2 Surrounding properties

Seven (7) properties within a 1 km radius have been classified as *'Remediated for restricted use"*, located north of the site. Table 3-3 provides a summary of the property details, and the BSR for the properties is provided in Appendix E.

Table 3-3: DWER Online Contaminated Sites Database Search

Property Description	Address	Classification	Distance from Site	Reason for Classification
Lot 201 on Plan 76615	198 Hanrahan Rd Mount Elphinstone, WA, 6330	Remediated for Restricted Use (26/02/2021) ID no: 72939	820 m	A preliminary site investigation in 2004 identified that the north-eastern portion of this site was historically used as a sand quarry up until the 1960s. The quarry void was subsequently used for the disposal of industrial wastes associated with the nearby fertiliser works. Wastes disposed included neutralised lead sulphate chamber washings, and contaminated sediments dredged from drainage systems during the 1980s. At the time of classification, the site was used for passive agricultural uses, including a tree plantation. Remedial works were historically undertaken at this site which involved the excavation and off-site disposal of lime solids waste. It is understood that remedial works were guided by in-field x-ray fluorescence measurements and included the collection of soil validation samples. However, limited documentation was prepared at the time to demonstrate the effectiveness of these remedial works. A targeted soil investigation was undertaken in 2018 as part of a broader detailed site investigation. Elevated concentrations of metals, such as lead, cadmium and copper, were identified at depths up to 1.5 metres below ground level. Groundwater at the site has been found to be acidic and have elevated concentrations of some metals (such as aluminium and iron) and fluoride. The elevated concentrations of aluminium and iron are associated with the acidic groundwater conditions which are likely caused, in part, by the presence of naturally occurring acid sulfate soils in the area.
Lot 201 on Plan 76615	198 Hanrahan Rd. Mount Elphinstone, WA, 6330	Remediated for Restricted Use (26/02/2021) ID no: 72938	615 m	A superphosphate fertiliser plant historically operated on the site for approximately 47 years, from 1954 to 2001. The site has also been used for fuel and chemical storage and fertiliser dispatch for approximately 67 years, since 1954. Historically, solid, and liquid wastes were disposed on-site. Fertiliser production, fuel and chemical storage and landfilling are land uses which have the potential to cause contamination. Lead-impacted soils in the sulphur pad area were further investigated (2018) and confirmed to be

Property Description	Address	Classification	Distance from Site	Reason for Classification
				localised in nature. Several soil samples reported lead at concentrations exceeding Ecological Investigation Levels and Health Investigation Levels for commercial and industrial land. An estimated 220 cubic metres of lead-impacted material remains at the site which poses a potential risk to human health and requires ongoing management. Anecdotal information indicates empty railway carts were historically parked in this area and residual superphosphate fertiliser in the carts was swept out onto the soil surface. This area was subject to targeted remediation in June 2019, with approximately 200 cubic metres of phosphorus-impacted surface soils being excavated and reused off-site as fertiliser. Groundwater in the vicinity of the sulfur pad is highly acidic, with pH values less than 3 in some monitoring locations. Concentrations of lead in groundwater near the sulfur pad (where lead-impacted soils remain) are generally low and appear to be decreasing over time. Concentrations of lead in recent years have been well below assessment levels relevant to the non-potable use of groundwater.
Lot 76 on Plan 26132	76 Grey St Mount Melville, WA, 6330	Remediated for Restricted Use (29/10/2018)	420 m	This site formed a portion of a larger land-holding occupied by the Albany fertiliser works. A preliminary site investigation was undertaken in 2004 which found that the site had not historically been used for any purpose related to the fertiliser works. However, the south-western portion of the site was used as a bulk fuel depot for approximately 18 years between 1956 and 1974. Soil investigations were undertaken in 2017 specifically targeting soils in the vicinity of the abandoned ASTs and other buildings associated with the former use of the site. Petroleum hydrocarbon impacts were not identified, however, an area of lead-impacted soils was identified adjacent to the opening of an unknown concrete building. The source of the lead was not known but was suspected to be associated with runoff from surfaces of the building potentially coated with lead-based paint. Remedial works were undertaken during 2018 comprising the excavation and off-site disposal of approximately half a cubic metre of lead-contaminated soils. Final validation sampling and analysis demonstrated that lead-impacted soils exceeding relevant health-based and ecological based screening criteria had been successfully remediated. Periodic groundwater monitoring has been undertaken at the site and across the broader catchment area which includes a former fertiliser manufacturing facility to the west and an operating municipal landfill to the north. These investigations have found that groundwater to the north and west of this site has been impacted by landfill leachate associated with the municipal landfill located at 37 Maxwell Street, Mount Melville. Nutrients, acidity and metals (such as iron, copper and zinc) were also identified in groundwater at levels exceeding assessment levels for marine waters (DER, 2014). These criteria are relevant given the site is within 500 metres of Princess Royal Harbour. However, a review of groundwater data from across the catchment area indicates that the levels of nutrients, acidity, and metals in groundwater beneath this site are indicative of background up-hydraulic
Lot 877 on Plan 159791	877 Grey St Mount Melville, WA, 6330	Remediated for Restricted Use (29/10/2018)	420 m	
Lot 76 on Plan 26132	76 Grey St Mount Melville, WA, 6330	Remediated for Restricted Use (29/10/2018)	420 m	
Lot 893 on Plan 159791	893 Spearwood Rd Mount Melville, WA, 6330	Remediated for Restricted Use (29/10/2018)	420 m	
Lot 91 on Plan 222006	294 Grey St Mount Melville, WA, 6330	Remediated for Restricted Use (29/10/2018	420 m	

Property Description	Address	Classification	Distance from Site	Reason for Classification
				gradient groundwater quality.

3.5 Australian and State Heritage Registers

3.5.1 Federal Heritage

A search of the Australian Heritage Trust Database[7] was undertaken on 15 June 2022 for wider site area. The search did not identify the presence of any items of national significance at, or in the immediate vicinity of the site.

3.5.2 Heritage Council of Western Australia

A database search of the WA State Heritage Office[8] was undertaken on 15 June 2022 for the wider site area. The search did not identify the presence of any items of state registered places at the site.

3.5.3 Department of Indigenous Affairs

A search of the Government of Western Australia, Department of Aboriginal Affairs Aboriginal Heritage Inquiry System (AHIS)[9] was undertaken on 15 June 2022. The search did not identify the presence of any heritage item on the AHIS. The closest heritage item is located immediately north of the sites and is called the Frenchman Bay Road Camp and is registered for Mythological, Camp and Natural Feature.

3.6 Previous Site Investigations

JBS&G is unaware of any previous environmental investigations undertaken at the site.

[7] http://www.environment.gov.au/cgi-bin/ahdb/search.pl
[8] http://inherit.stateheritage.wa.gov.au/Public/?advanced=True.
[9] https://espatial.dplh.wa.gov.au/AHIS/index.html?viewer=AHIS.

4. Discussion

4.1 Site Observation

During the site inspection, notable illegal dumping/fly tipping was observed throughout the south-eastern corner of the historical Woolstores site, which generally comprised of material including PACM, household rubbish, white goods, tyres, steel beams, wooden pallets, and building rubble. PACM was also observed around the warehouses being demolished. No obvious contamination was observed in the rural residential properties surrounding the Woolstores site. Although off-site, earthworks had begun to the north of the northern rural properties and clean imported fill (limestone roadbase – sourced from a quarry) covering most of the lots. It should be noted that although no visual or olfactory signs of contamination were observed, although undeveloped, potential contamination may exist in the undeveloped rural properties that were not inspected.

4.2 Areas of Potential Environmental Concern

Based on the information obtained in the desktop component of the investigation and site works the areas of potential environmental concern (APEC) outlined below were identified and assessed as part of the PSI.

1. Former site structures and stockpiled soils.
2. Illegal dumping/fly tipping activities.
3. Potential uncontrolled fill.
4. Historical industrial land use of the site.
5. Migration of potentially contaminated groundwater beneath the site from up-gradient properties.

4.2.1 Former Site Structures and Stockpiled Soil

The site investigation included an assessment for potential ACM (PACM) associated with demolition, dilapidation of former site structures and stockpiled soils. Fragments of PACM were observed at multiple locations during the site inspection. The presence of PACM fragments presents a potentially unacceptable health risk to future residents and construction workers, as well as an aesthetic risk. The potential for fibre generation during civil works also poses a risk to on-site receptors.

Stockpiled soil was also present throughout the site. Stockpiled soil on the Woolstores lots was observed to contain a combination of building rubble, sheet metal, steel and PACM. Stockpiled material present off-site of the northern boundary of the northern rural residential properties was assumed to be representative of the topsoil layer that was been scraped away before the limestone roadbase was imported. The origin of this limestone road base is from the Great Southern Region Quarry Pits. The quarry certificates are presented in Appendix G.

4.2.2 Illegal Dumping/ Fly Tipping

Along the eastern portion of the Woolstores lots, illegal dumping/ fly tipping was observed. Fragments of PACM were observed at multiple locations during the site inspection. The presence of PACM fragments and other COPCs associated with fly tipping (metal pipes, steel framework, sheet metal, concrete, paint tins, bricks, tyres etc.) presents a potentially unacceptable health risk to future residents and construction workers, as well as an aesthetic risk.

4.2.3 Potential Uncontrolled Fill

The Woolstores site has been built on reclaimed land. There is a potential risk associated with the unknown nature and extent of the imported material. During the preliminary site investigation,

PACM fragments were observed within the fill material that was used to create site levels as they are today. The uncontrolled fill presents a potentially unacceptable health risk to future residents and construction workers, as well as an aesthetic risk.

At the time of inspection, north of the northern rural residential properties (off-site) had been cleared of most vegetation and site structures (residential houses). Limestone road base had been imported to assist with site levels. The origin of this limestone road base is from the Great Southern Region Quarry Pits. The quarry certificates are presented in Appendix G.

4.2.4 Historical Land Uses

The Woolstores site has been subject to commercial/ industrial land uses for roughly 70 years. There is potential for site wide contamination associated with these historical potentially contaminating activities to exist. The Woolstores site while operational was used as a wool storage facility with truck and machinery access. During the PSI, soak wells were observed but the linings were unable to be visually assessed. Further assessment to determine whether the soak wells are lined or unlined is required. Most of the site is also unsealed creating a potential pathway for contaminants from onsite activities to leach through the soil profile to impact groundwater.

The remainder of the site has been subject to rural residential land uses. The southern properties contained residential dwellings and small sheds. At the time of inspection there was no visual or olfactory signs of contamination on the properties. Although there were no visual or olfactory signs of contamination observed, this does not discount the possibility that contamination exists.

At the time of inspection, the northern rural properties had been cleared of all dwellings and structures. Imported limestone roadbase was present on the surface to assist with site levels. Therefore, the northern rural properties could not be inspected for potential areas of contamination. An assessment of contaminants associated with the rural residential properties will also be required. This will confirm if there are potential sources of contamination present that have been covered by the roadbase fill material that pose risk to current and future receptors.

4.2.5 Migration of potentially contaminated groundwater from up-gradient properties

Table 3.3 identified various up-gradient properties that are impacted by contaminated groundwater. Based on the information reviewed, it is possible that these impacts have migrated on-site. General regional groundwater quality is known to be acidic. As future land uses on-site are proposed to be a combination of residential and mixed commercial uses, there is a risk that site receptors may come into contact with this contaminated groundwater if abstracted for use. Groundwater in the local area is also relatively shallow (<2m bgl).

5. Conceptual Site Model

The information herein together with the figures included with this report, aid in presenting a conceptual site model (CSM) for the site, based on relevant site setting information, background historical site information.

For a potential contamination risk to be present at a site, a complete exposure pathway must exist which consists of:

- areas of potential environmental concern (e.g., primary sources such as leaking chemical tanks; secondary sources such as impacted soils/groundwater/surface water);
- a transport mechanism (pathway) between the source and the receptor (e.g., direct dermal contact with soil/dust/water, inhalation of vapours, migration of groundwater through aquifer matrix);
- an exposure point where a receptor comes into contact with the contamination; and
- an exposure route (i.e., inhalation, ingestion or dermal).

5.1 Areas of Potential Environmental Concern

Based on the information obtained in the desktop assessment and site inspection the following APEC were identified:

1. Former site structures and stockpiled soils
2. Illegal dumping/fly tipping activities.
3. Potential uncontrolled fill.
4. Historical land uses of the site.
5. Migration of potentially contaminated groundwater beneath the site from up-gradient properties.

5.2 Potential Receptors

On Site

- Current and future excavation/maintenance workers potentially exposed to impacted soils and groundwater during trenching works, dewatering works or remedial works.
- Future on-site residents
- Terrestrial ecology.
- Surface water at the site
- Groundwater beneath the site.

Off Site

The following potential off-site receptors have been identified in the event that site derived contamination is migrating off site.

- Current and future excavation/maintenance workers potentially exposed to impacted soils and/or groundwater during trenching works or remedial works completed adjacent to the site.

- Future off-site residents and site visitors.
- Terrestrial ecology
- Surface water bodies

5.3 Potential Pathways

Potential contaminant exposure or migration pathways for the COPCs are summarised below.

- Infiltration of contaminants into the underlying soil and groundwater.
- Vapour migration from impacted soil or groundwater.
- Direct contact with impacted soils or groundwater.
- Windblown dusts and/or fibres.
- Groundwater migration and abstraction.

Potential exposure routes for human health include:

- Dermal contact.
- Ingestion.
- Inhalation.

Potential exposure routes for ecological receptors include:

- Direct contact.
- Uptake through roots.

5.4 Potential Pollutant Linkages

Table 5-1 provides a summary of updated potential pollutant linkages of the conceptual site model.

Table 5-1: Updated Potential Pollution Linkages

APEC	Receptor	Exposure Pathway	Linkage Status	Justification
1.Contamination associated with the former site structures and stockpiled soils. COPC • ACM • TRH • BTEX • PAH • VOC/sVOC •Metals	**Onsite -** future site visitors and residents.	Dermal contact and incidental ingestion of soil and/or groundwater.	Possible	Stockpiled soils were observed on Lot 1104 and off-site (north of Lot 11 and Lot 140 – not included in this investigation). The nature and extent of potential contamination within the stockpiled soil on Lot 1104 is currently unknown. Risks to onsite workers, visitors and residents via dermal contact of soil is possible. The leaching of potential contaminants associated with the stockpiled soils can possibly migrate to groundwater. Dermal contact of groundwater for site visitors and residents on-site will only be possible through groundwater abstraction. Dermal contact of groundwater for on-site site visitors and residents is considered highly unlikely as there are no current abstraction bores on-site. It is highly unlikely that a bore will be installed in the future due to the saline nature of the groundwater.
		Inhalation of dust and fibres	Possible	There is a possibility that wind can generate dust off the stockpiles and therefore mobilise the identified stockpiles COPC, creating unacceptable risks to future on-site workers, visitors and residents via dust inhalation. The preliminary site investigation identified PACM within Lot 1104, 1209, 895 and 1350. The presence of PACM fragments in these areas present a potentially unacceptable health risk to future residents, workers and site visitors, including an aesthetic risk. **Qualitative Risk Rating: Moderate**
	Onsite - intrusive maintenance and civil contractors	Dermal contact and incidental ingestion of soil and/or groundwater.	Possible	Stockpiled soils were observed on Lot 1104 and off-site (north of Lot 11 and Lot 140 – not included in this investigation). The nature and extent of potential contamination within the stockpiled soils is currently unknown. Risks to intrusive maintenance workers and civil contractors via dermal contact of stockpiled soil is possible. The leaching of potential contaminants associated with the stockpiled soils can possibly migrate to groundwater. As groundwater at the site is shallow, intrusive maintenance workers and civil contractors may encounter potentially contaminated groundwater.
		Inhalation of dust and fibres	Possible	There is a possibility that future civil works generate dust and therefore mobilise the identified stockpiles COPC, creating unacceptable risks to intrusive maintenance and civil contractors via dust inhalation. The preliminary site investigation identified PACM within Lot 1104, 1209, 895 and 1350. Excavation activities (particularly during development) could result in significant disturbance of PACM and potential for generation of fibres if not appropriately managed. **Qualitative Risk Rating: Moderate**
	Onsite – Ecological Receptors	Uptake by roots	Possible	Vegetated areas for the current (general industry and rural residential) and future (mixed use) land uses are considered to be low ecological significance. No signs of vegetation stress were observed during the preliminary site investigation. **Qualitative Risk Rating: Low**

Table 5-1: Updated Potential Pollution Linkages

APEC	Receptor	Exposure Pathway	Linkage Status	Justification
	Offsite - human receptors including recreational users of the Royal Princess Harbour	Dermal contact and incidental ingestion of groundwater.	Unlikely	Stockpiled soils were observed on Lot 1104 and off-site (north of Lot 11 and Lot 140 – not included in this investigation). The nature and extent of potential contamination within the stockpiled soils is currently unknown. There is a possibility (unlikely) that potentially impacted soils may leach into groundwater and then migrate off-site where recreational users of the marine environment may be exposed via dermal contact and incidental ingestion. The closest groundwater abstraction bore is 1.2 km cross-gradient (west) of the site, it is therefore considered that potential contaminants from the site present in groundwater (if present) will not impact the human receptors abstracting water from the bore.
		Inhalation of dust and fibres	Possible	There is a possibility that future civil works and wind generate dust and therefore mobilise the identified stockpiles COPC, creating unacceptable risks to off-site human receptors via dust inhalation. The preliminary site investigation identified PACM within Lot 1104, 1209, 895 and 1350. Development activities would result in significant disturbance of soils and possible generation of fibres which may impact offsite receptors if not appropriately managed. **Qualitative Risk Rating: Low**
	Offsite - Ecological Receptors	Direct Contact	Unlikely	The Royal Princess Harbour is the closest down-gradient ecological receptor to the site. The Royal Princess Harbour is located along the southern boundary of the site. Leaching of contaminants within the stockpiled material to groundwater and subsequent off-site migration is possible, although unlikely, and could pose risks to the sensitive ecological receptors (if reported above ecological criteria) within the Harbour. **Qualitative Risk Rating: Low**
2. Illegal dumping/ Fly tipping activities <u>COPC</u> • ACM • TRH • BTEX • PAH • VOC/sVOC •Metals	**Onsite -** future site visitors and residents.	Dermal contact and incidental ingestion of soil and/or groundwater.	Possible	During the site inspection, fly tipping was observed in areas of cleared land, primarily located in the eastern portion of the site. The nature and extent of this fly tipping is currently unknown but is comprised mainly of steel structures, metal sheeting and wire, concrete, rubble, concrete pipes etc. It is possible that fly tipping may have resulted in contamination to the underlying soils. If disturbance works are completed on the material, there is possibility for residents, on-site workers and visitors to be exposed to contaminants. Fly tipping also represents an aesthetic risk. Potential groundwater impacts through leaching are unknown but are considered unlikely.
		Inhalation of impacted dusts/fibres	Possible	PACM along with other COPCs were observed in association with the fly tipping observed on-site. It is possible that fly tipping may have resulted in contamination to the underlying soils. Therefore, future civil works that generate dust and therefore mobilise the identified COPC, can creating unacceptable risks on-site future workers, site visitors and residents via dust and fibre inhalation. **Qualitative Risk Rating: Low**

Table 5-1: Updated Potential Pollution Linkages

APEC	Receptor	Exposure Pathway	Linkage Status	Justification
	Onsite - intrusive maintenance and civil contractors	Inhalation of impacted dusts/fibres. Dermal contact and incidental ingestion of soil and/or groundwater.	Possible Possible	During the site inspection, fly tipping was observed in areas of cleared land, primarily located in the eastern portion of the site. The nature and extent of this fly tipping is currently unknown but is comprised mainly of steel structures, metal sheeting and wire, concrete, rubble, concrete pipes etc. If disturbance works are completed on the material, there is possibility for contaminants and PACM to be exposed to onsite intrusive maintenance workers. The current nature and extent of contaminants associated with fly tipping is currently unknown, although, potential groundwater impacts through leaching that pose risks to future onsite intrusive maintenance and civil contractors are considered low (groundwater assumed to be less than 2 m bgl). **Qualitative Risk Rating: Low**
	Onsite – Ecological Receptors	Uptake by roots	Unlikely	Vegetated areas for the current (general industry and rural residential) and future (mixed use) land uses are considered to be low ecological significance. No signs of vegetation stress were observed during the preliminary site investigation. **Qualitative Risk Rating: Low**
	Offsite - Current and future off-site workers and residents	Inhalation of impacted dusts/fibres Dermal contact and incidental ingestion groundwater.	Possible Unlikely	During the site inspection, fly tipping was observed in areas of cleared land, primarily located in the eastern portion of the site. The nature and extent of this fly tipping is currently unknown but is comprised mainly of steel structures, metal sheeting and wire, concrete, rubble, concrete pipes etc. On-site civil works and wind can mobilise contaminants and PACM associated with fly tipping, it is possible for contaminants to pose a risk to off-site site workers and residents. The current nature and extent of contaminants associated with fly tipping is unknown, therefore, potential groundwater impacts through leaching are unknown. Dermal contact and incidental ingestion of potentially contaminated groundwater for future off-site workers and residents is considered unlikely as there are no down gradient off-site residents or site workers. The closest groundwater abstraction bore is 1.2 km cross-gradient (west) of the site, it is therefore considered that potential contaminants from the site present in groundwater will not impact the human receptors abstracting water from the bore. **Qualitative Risk Rating: Low**
	Offsite – recreational users of the Royal Princess Harbour	Inhalation of impacted dusts/fibres Dermal contact and incidental ingestion of groundwater.	Possible Unlikely	During the site inspection, fly tipping was observed in areas of cleared land, primarily located in the eastern portion of the site. The nature and extent of this fly tipping is currently unknown but is comprised mainly of steel structures, metal sheeting and wire, concrete, rubble, concrete pipes etc. On-site civil works and wind can mobilise contaminants and PACM associated with fly tipping, it is possible for contaminants to pose a risk to off-site recreational users of the Royal Princess Harbour. Potential contaminants associated with onsite fly tipping are unknown. Contaminated groundwater on-site associated with the leaching of COPC from fly tipping could migrate off-site and be expressed as surface water in Princess Harbour. Ingestion of this contaminated groundwater by recreational users (now

Table 5-1: Updated Potential Pollution Linkages

APEC	Receptor	Exposure Pathway	Linkage Status	Justification
				expressed as surface water) is unlikely. **Qualitative Risk Rating: Low**
	Offsite – Ecological Receptors	Direct Contact	Unlikely	The Royal Princess Harbour is the closest down-gradient ecological receptor to the site. The Royal Princess Harbour is located along the southern boundary of the site. Leaching of contaminants within the fly tipping material to groundwater and subsequent off-site migration is possible, although unlikely, and could pose risks to the sensitive ecological receptors (if reported above ecological criteria) within the Harbour. **Qualitative Risk Rating: Low**
3. Potential uncontrolled fill <u>COPC</u> • Asbestos • TRH • BTEX • PAH • VOC/sVOC •Metals	**Onsite -** future site visitors and residents.	Dermal contact and incidental ingestion of soil and/or groundwater. Inhalation of impacted dusts/fibres	Possible Possible	Review of historical aerial imagery at the site identified the potential for uncontrolled fill placement prior to, and during, development of the Woolstores site. During the site inspection it was noted that the site was generally flat, and slopes to the south towards Princess Royal Harbour. The Woolstores warehouses have been built on top of the reclaimed land. The imported material was observed to contain PACM along with other rubble. At the time of inspection, the off-site northern rural residential properties had been cleared of most vegetation and site structures (residential houses). A limestone road base was imported to assist with site levels. The origin of this limestone road base is from the Great Southern Region Quarry Pits. The quarry certificates are presented in Appendix G and does not pose any risks to receptors. The areas that have been subject to imported fill (the material under the Woolstores warehouses) could potentially pose risks via direct contact, dust and fibre inhalation, although the nature and extent of contamination is currently unknown. As the nature and extent of contaminants associated with the potential uncontrolled fill is currently unknown, potential groundwater impacts through leaching are possible. Dermal contact of groundwater for site visitors and residents on-site will only be possible through groundwater abstraction. Dermal contact of groundwater for on-site site visitors and residents is considered highly unlikely as there are no current abstraction bores on-site. It is also highly unlikely that a bore will be installed in the future due to the saline nature of the groundwater. **Qualitative Risk Rating: Low/Moderate**
	Onsite - intrusive maintenance and civil contractors	Inhalation of impacted dusts/fibres. Dermal contact and incidental ingestion of soil and/or groundwater.	Possible Possible	Review of historical aerial imagery at the site identified the potential for uncontrolled fill placement prior to, and during, development of the site. During the site inspection it was noted that the site was generally flat, and slopes to the south towards Princess Royal Harbour. The Woolstores warehouses have been built on top of the reclaimed land. The imported material was observed to contain PACM along with other rubble. At the time of inspection, the off-site northern rural residential properties had been cleared of most vegetation and site structures (residential houses). A limestone road base was imported to assist with site levels. The origin of this limestone road base is from the Great Southern Region Quarry Pits. The quarry certificates are presented in Appendix G and does not pose any risks to receptors. The areas that have been subject to imported fill (the material under the warehouses) could potentially pose risks via direct contact and fibre inhalation, when civil works begin or general intrusive maintenance works. The current nature and

Table 5-1: Updated Potential Pollution Linkages

APEC	Receptor	Exposure Pathway	Linkage Status	Justification
				extent of contaminants associated with the imported fill is currently unknown, therefore, potential groundwater impacts through leaching of the potentially contaminated soil are unknown but could pose risks to future onsite intrusive maintenance and civil contractors (groundwater assumed to be less than 2 m bgl). **Qualitative Risk Rating: Low/Moderate**
	Onsite – Ecological Receptors	Uptake by roots	Possible	Vegetated areas for the current (general industry and rural residential) and future (mixed use) land uses are considered to be low ecological significance. No signs of vegetation stress were observed during the preliminary site investigation. **Qualitative Risk Rating: Low**
	Offsite - Current and future off-site workers and residents	Inhalation of impacted dusts/fibres Dermal contact and incidental ingestion of groundwater.	Possible Unlikely	It is possible for dust to be generated during future excavation and earthworks of material on-site. PACM was observed within the fill material present on the Woolstores lots. There are surrounding residential and industrial properties that may be at risk from impacted dusts/ fibres once airborne. a potential pathway link via leaching of contaminants within the fill to offsite receptors. As groundwater flow direction is to the south (Princess Harbour), the likelihood of exposure to off-site site workers and residents is unlikely Potential contaminants present in the fill material on site are unknown. Groundwater is present between roughly 0 – 2 m bgl and is therefore. **Qualitative Risk Rating: Low**
	Offsite – recreational users of the Royal Princess Harbour	Inhalation of impacted dusts/fibres Dermal contact and incidental ingestion of groundwater.	Possible Unlikely	On-site civil works and wind can mobilise contaminants and PACM associated with fly tipping, it is possible for contaminants to pose a risk to off-site recreational users of the Royal Princess Harbour. Contaminated groundwater on-site associated with the leaching of COPC from the imported fill could migrate off-site and be discharged to surface water in Princess Harbour. Contact with contaminated groundwater by recreational users is unlikely. **Qualitative Risk Rating: Moderate**
	Offsite – Ecological Receptors	Direct Contact	Possible	The Royal Princess Harbour is the closest down-gradient ecological receptor to the site. The Royal Princess Harbour is located along the southern boundary of the site. Leaching of contaminants within the fly tipping material to groundwater and subsequent off-site migration is possible, although unlikely, and could pose risks to the sensitive ecological receptors (if reported above ecological criteria) within the Harbour. **Qualitative Risk Rating: Moderate**
4. Historical land uses of the site.	**Onsite -** Current and site visitors	Dermal contact and incidental ingestion of soil and/or groundwater.	Possible	The historical operation of the Woolstores lots as industrial since the 1950s and rural residential land uses in the remaining lots has the potential to cause contamination. Historical aerials suggest that the site has been predominantly unsealed including at the time of this investigation. Potential hydrocarbons, pesticides

Table 5-1: Updated Potential Pollution Linkages

APEC	Receptor	Exposure Pathway	Linkage Status	Justification
COPC • TRH • BTEX • PAH • VOC/sVOC • OCP/OPP •Metals •Asbestos	and residents.			and heavy metals could be present through the unsealed soil profile and groundwater onsite. The on-site drain network present on the Woolstores lots could act as a potential pathway for contaminated soils to leach into groundwater on-site. The northern rural residential lots, although undeveloped, have the potential to be the source of contamination. No visual or olfactory contamination was observed at the rural residential lots at the time of inspection, although, this does not discount the possibility of contamination being present. As the nature and extent of contaminants associated with the historical land uses is currently unknown, potential groundwater impacts through leaching are possible. Dermal contact of groundwater for site visitors and residents on-site will only be possible through groundwater abstraction. Dermal contact of groundwater for on-site site visitors and residents is considered highly unlikely as there are no current abstraction bores on-site. It is also highly unlikely that a bore will be installed in the future due to the saline nature of the groundwater.
		Inhalation of vapours	Unlikely	Potential hydrocarbon contamination in the soil profile can also migrate via leaching into groundwater and may represent a risk to human receptors via vapour inhalation. Although, no hydrocarbon staining or contamination was observed, therefore, the risk of this is considered low.
		Inhalation of fibres	Possible	Historical building structures (PACM roofing panels) were observed during the site inspection, although were in the process of being removed. There is still a possibility that fugitive PACM fragments will exist in the surrounding soil once the roofing panels have been removed. **Qualitative Risk Rating: Low**
	Onsite - intrusive maintenance and civil contractors	Dermal contact and incidental ingestion of soil and/or groundwater.	Possible	The historical operation of the Woolstores lots as industrial since the 1950s and rural residential land uses in the remaining lots has the potential to cause contamination. Historical aerials suggest that the site has been predominantly unsealed including at the time of this investigation. Potential hydrocarbons, pesticides and heavy metals could be present through the unsealed soil profile and groundwater onsite. The on-site drain network present on the Woolstores lots could act as a potential pathway for contaminated soils to leach into groundwater on-site. No visual or olfactory contamination was observed at the rural residential lots at the time of inspection, although, this does not discount the possibility of contamination being present. As the nature and extent of contaminants associated with the historical land uses is currently unknown, potential groundwater impacts through leaching are possible and pose risks to intrusive maintenance workers and civil contractors (groundwater assumed to be less than 2 m bgl).
		Inhalation of vapours	Possible	Based on the depth to groundwater, intrusive workers could potentially come into contact with groundwater at the site. The current nature and extent of contaminants associated with the historical industrial land use is currently unknown, therefore, potential groundwater impacts through leaching are

Table 5-1: Updated Potential Pollution Linkages

APEC	Receptor	Exposure Pathway	Linkage Status	Justification
		Inhalation of fibres	Possible	unknown but could pose risks to future onsite intrusive maintenance and civil contractors (groundwater assumed to be less than 2 m bgl). If present, vapours have the potential to accumulate in trenches and excavations posing unacceptable risks to intrusive maintenance workers and civil contractors. Historical building structures (PACM roofing panels) were observed during the site inspection, although were in the process of being removed. There is still a possibility that fugitive PACM fragments will exist in the surrounding soil once the roofing panels have been removed. This PACM material (if present) will pose risks to onsite intrusive maintenance and civil contractors via fibre inhalation. **Qualitative Risk Rating: Low**
	Onsite – Ecological Receptors	Uptake by roots	Possible	Vegetated areas for the current (general industry and rural residential) and future (mixed use) land uses are considered to be low ecological significance. No signs of vegetation stress were observed during the preliminary site investigation. **Qualitative Risk Rating: Low**
	Offsite - human receptors including residents and recreational users of the Royal Princess Harbour	Dermal contact and incidental ingestion of groundwater.	Unlikely	Potential contaminants associated with the historical industrial land use of the Woolstores lots are unknown. Potentially contaminated soils on-site could possibly leach into the shallow groundwater and migrate down gradient to the Princess Harbour and become expressed as surface water. Dermal contact and incidental ingestion of potentially contaminated groundwater (expressed as surface water) for recreational receptors in the Royal Princess Harbour is considered possible but unlikely.
		Inhalation of dust and fibres	Possible	It is possible for contaminated dust and PACM fibres to be generated during future excavation, earthworks and wind. Surficial PACM was observed throughout the Woolstores lots. There are surrounding residential and industrial properties that may be at risk from impacted dusts/ fibres if airborne. Recreational users of the Royal Princess Harbour could potentially be at risk from fibres and dust generated from wind and during future excavation and earthworks of material onsite. **Qualitative Risk Rating: Low**
	Offsite - Ecological Receptors	Direct Contact	Possible	The Royal Princess Harbour is the closest down-gradient ecological receptor to the site. The Royal Princess Harbour is located along the southern boundary of the site. Leaching of contaminants within the soil to groundwater and subsequent off-site migration is possible, although unlikely, and could pose risks to the sensitive ecological receptors (if reported above ecological criteria) within the Harbour. **Qualitative Risk Rating: Low**
5. Migration of contaminated groundwater	**Onsite -** Current and future on-site	Dermal contact and incidental ingestion of groundwater.	Possible	There are various properties to the north of the site that have been classified as Remediated for Restricted Use (commercial/ industrial). Groundwater from these up-gradient properties have reported acidic conditions and contain elevated concentrations of metals (aluminium, iron, copper and zinc). The acidic

Table 5-1: Updated Potential Pollution Linkages

APEC	Receptor	Exposure Pathway	Linkage Status	Justification
from up-gradient properties COPC • pH •Metals	workers, site visitors and residents.			groundwater conditions are thought to be representative of regional conditions, although, elevated concentrations of metals are associated with the contaminating activities from the up-gradient classified sites. There is no evidence to confirm that these impacts have migrated off-site (creating a 'source site'). If these impacts were to migrate off-site and come on-site, dermal contact and ingestion of water would only be possible through groundwater abstraction. Dermal contact of groundwater for on-site site visitors and residents is considered highly unlikely as there are no current abstraction bores on-site. It is also highly unlikely that a bore will be installed in the future due to the saline nature of the groundwater. **Qualitative Risk Rating: Low**
	Onsite intrusive maintenance and civil contractors	Dermal contact and incidental ingestion of groundwater.	Possible	There are various properties to the north of the site that have been classified as Remediated for Restricted Use (commercial/ industrial). Groundwater from these up-gradient properties have reported acidic conditions and contain elevated concentrations of metals (aluminium, iron, copper and zinc). However, a review of groundwater data from across the catchment area indicates that the levels of nutrients, acidity, and metals in groundwater beneath this site are indicative of background up-hydraulic gradient groundwater quality. There is no evidence to confirm that these impacts have migrated off-site (creating a 'source site'). Groundwater on-site could potentially be intersected by regular maintenance activities and therefore may present unacceptable risks for intrusive maintenance workers.. **Qualitative Risk Rating: Moderate**
	Onsite – Ecological Receptors	Uptake by roots	Possible	Vegetated areas for the current (general industry and rural residential) and future (mixed use) land uses are considered to be low ecological significance. No signs of vegetation stress were observed during the preliminary site investigation. **Qualitative Risk Rating: Low**

6. Conclusions and Recommendations

6.1 Conclusions

JBS&G Australia Pty Ltd, was commissioned by Rowe Group (the client) to undertake a Preliminary Site Investigation (PSI) for the ten (10) Lot Parcel of land at Woolstores Place (the site).

Based on the information obtained in the desktop assessment and site inspection the following APEC were identified at the site, which are discussed in detail below:

1. Former site structures and stockpiled soils
2. Illegal dumping/fly tipping activities.
3. Potential uncontrolled fill.
4. Historical land uses of the site.
5. Migration of potentially contaminated groundwater beneath the site from up-gradient properties.

Former Site Structures and Stockpiled Soils

The site investigation included an assessment for potential ACM (PACM) associated with demolition, dilapidation of former site structures and stockpiled soils. Fragments of PACM were observed at multiple locations during the site inspection. The presence of PACM fragments presents a potentially unacceptable health risk to future residents and construction workers, as well as an aesthetic risk. The potential for fibre generation during civil works also poses a risk to on-site receptors.

Stockpiled soil was also present throughout the site. Stockpiled soil on the Woolstores lots was observed to contain a combination of building rubble, sheet metal, steel and PACM.

Illegal Dumping/ Fly Tipping

Along the eastern portion of the Woolstores lots, illegal dumping/ fly tipping was observed. Fragments of PACM were observed at multiple locations during the site inspection. The presence of PACM fragments and other COPCs associated with fly tipping (metal pipes, steel framework, sheet metal, concrete, paint tins, bricks, tyres etc.) presents a potentially unacceptable health risk to future residents and construction workers, as well as an aesthetic risk.

Potential Uncontrolled Fill

The Woolstores site has been built on reclaimed land. There is a potential risk associated with the unknown nature and extent of the imported material. During the preliminary site investigation, PACM fragments were observed within the fill material that was used to create site levels as they are today. The uncontrolled fill presents a potentially unacceptable health risk to future residents and construction workers, as well as an aesthetic risk.

At the time of inspection, a limestone road base had been imported to assist with site levels off-site. The limestone road base originated from virgin quarry material[10]. As the material has been directly sourced from a quarry, the potential for contamination from this material to migrate on-site is considered negligible. It should be noted that the imported limestone clean fill is off-site as the site boundary has changed.

[10] Mainroads Western Australia – Great Sothern Region – ARR Material Summary, Armstrong's Gravel Pit, Main Roads Limestone Pit.

Historical Land Uses

The Woolstores site has been subject to commercial/ industrial land uses for roughly 70 years. There is potential for site wide contamination associated with these historical potentially contaminating activities to exist. The Woolstores site while operational was used as a wool storage facility with truck and machinery access. During the PSI, soak wells were observed but the linings were unable to be visually assessed. Further assessment to determine whether the soak wells are lined or unlined is required. Most of the site is also unsealed creating a potential pathway for contaminants from onsite activities to leach through the soil profile to impact groundwater.

Migration of potentially contaminated groundwater from up-gradient properties

Table 3.3 identified various up-gradient properties that are impacted by contaminated groundwater. Based on the information reviewed, it is possible that these impacts have migrated on-site. General regional groundwater quality is known to be acidic. As future land uses on-site are proposed to be a combination of residential and mixed commercial uses, there is a risk that site receptors may come into contact with this contaminated groundwater if abstracted for use. Groundwater in the local area is also relatively shallow (<2m bgl).

Acid Sulfate Soils

The DWER (2015) guidance states that in areas of 'High to Moderate risk' of ASS occurring, an ASS investigation is required prior to the following ground disturbance activities:

- Earthworks that will disturb more than 100 m^3 of soil.
- During dewatering or soil draining activity.

Given the site's aim is for re-zoning to a residential land use it is likely that both the ground disturbance events above will occur. This will, therefore, trigger the requirements for ASS investigation.

6.2 Recommendations

Further assessment or management/remediation of the potentially impacted soils should be considered to manage the potential risks to future site receptors. It is noted that an intrusive sampling program should be considered to fully characterise impacts associated with the APECs identified.

It is anticipated that construction works at the site, namely the installation of deep sewer, will necessitate the requirement for an ASS investigation. As such, it is recommended that an ASS investigation is completed so that any ASS risk can be understood and managed during construction.

It is recommended that JBS&G develop a Sampling Analysis and Quality Plan (SAQP) and subsequent Detailed Site Investigation (DSI) in order to characterise the nature, extent and risk of potential contamination onsite.

Table 6-1 below outlines a summary of the APECs that require further investigation and the assessment recommended to close relevant data gaps. It is strongly recommended that the proposed sampling regime be implemented after site demolition activities and removal of fly tipped wastes have been completed.

Table 6-1: Proposed Sampling Regime

APEC	Rationale	Assessment Required	Contaminants of potential concern (COPC)
1. Contamination associated with the former site structures and stockpiled soils	Assess the contamination status of the material throughout stockpiled material and assess presence of surficial ACM on-site (subsequent to the completion of site demolition activities).	Soil and Groundwater	• ACM • TRH • BTEX • PAH • VOC/sVOC • OCP/OPP •Metals
2. Illegal dumping/fly tipping activities.	Assess the contamination status of the material located below the fly tipping areas (subsequent to removal during demolition activities).	Soil and Groundwater	• ACM • TRH • BTEX • PAH • VOC/sVOC •Metals
3. Potential uncontrolled fill (Woolstores re-claimed land).	Assess the contamination status of the fill material comprising reclaimed land.	Soil and Groundwater	• Asbestos • TRH • BTEX • PAH • OCP/OPP •Metals
4. Historical land uses of the site.	Assess the contamination status of the material throughout the site, focused on industrial drainage infrastructure.	Soil and Groundwater	• TRH • BTEX • PAH • VOC/sVOC • OCP/OPP •Metals •Asbestos
5. Migration of potentially contaminated groundwater beneath the site from up-gradient properties.	Assess the contamination status of the groundwater migrating on-site.	Groundwater	• pH •Metals Nutrients

7. Limitation

This report has been prepared for use by the client who has commissioned the works in accordance with the project brief only and has been based in part on information obtained from the client and other parties.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

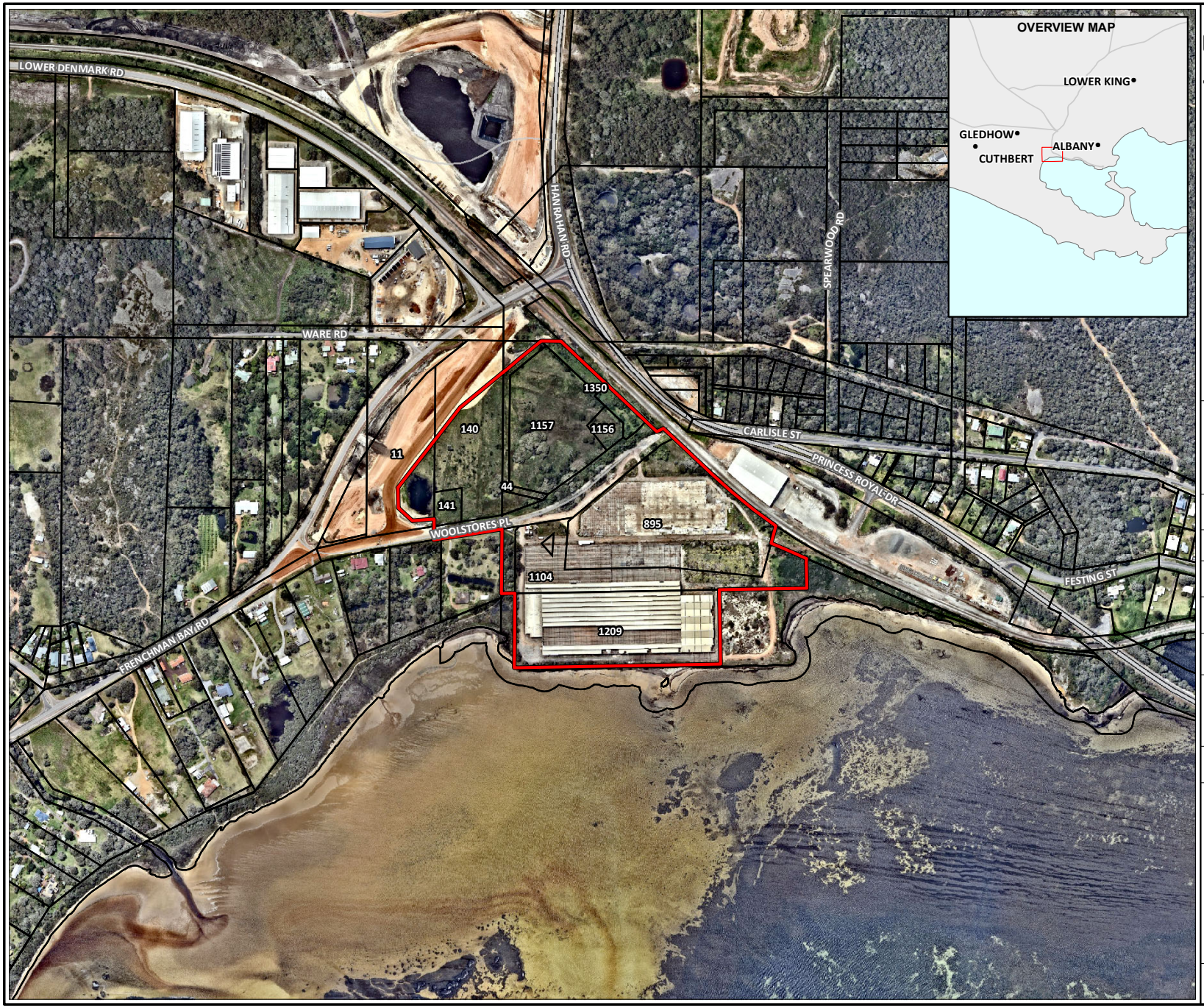
JBS&G accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced without prior approval by the client or amended in any way without prior approval by JBS&G, and should not be relied upon by other parties, who should make their own enquires.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, JBS&G reserves the right to review the report in the context of the additional information.

This report makes reference to legislation; however, JBS&G do not provide legal advice. The client should seek legal advice from a suitably qualified and experience professional in relation to the legislation referred to.

Figures



Legend

- Site boundary
- Cadastral boundary
- Highways
- Main road
- Minor road
- Pedestrian way
- Track

strategen JBS&G

Job No: 63117	
Client: Rowe Group	
Version: A	Date 10/02/2023
Drawn By: ianandagoda	Checked By: JN

Scale 1:7,500 at A4

0 100 200
metres

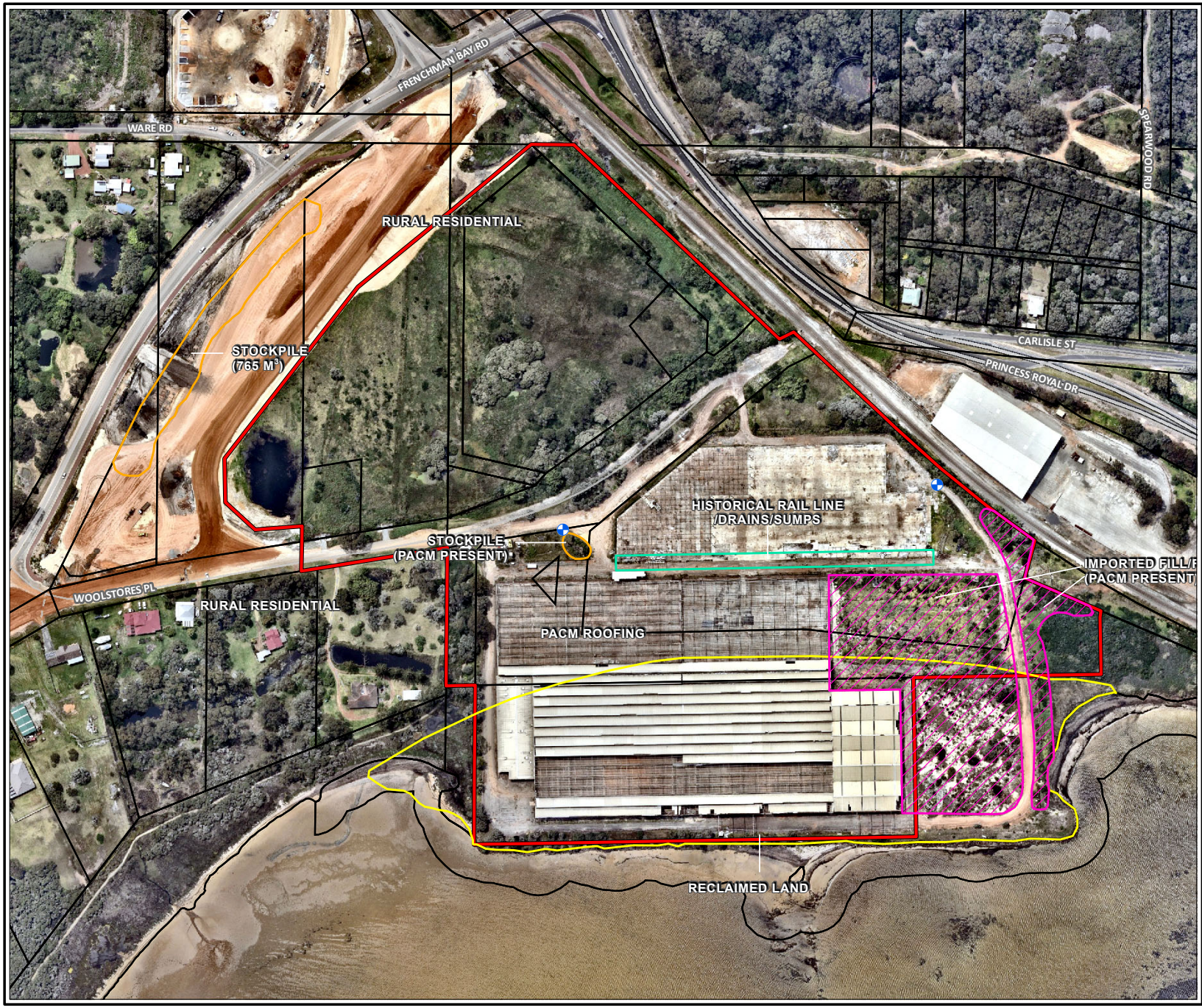
Coor. Sys. GDA 1994 MGA Zone 50

11 Lots, Woolstores Place Mt.Elphinstone, WA

SITE LOCATION

FIGURE 1

File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\Rowe\63117 Woolstores Place PSI\GIS\Maps\R01_Rev_B\63117_01_SiteLocn.mxd
Image Reference: www.nearmap.com© - Imagery Date: 16 November 2022.



Legend

- Site boundary
- Reclaimed land
- Stockpile
- Imported fill/fly tipping (PACM present)
- Historical rail line/ drains/ sumps
- PACM sheets
- Cadastral boundary
- Monitoring well
- Highways
- Main road
- Minor road
- Track

strategen JBS&G

Job No: 63117	
Client: Rowe Group	
Version: A	Date 10/02/2023
Drawn By: ianandagoda	Checked By: JN

Scale 1:3,500 at A4

0 50 100
metres

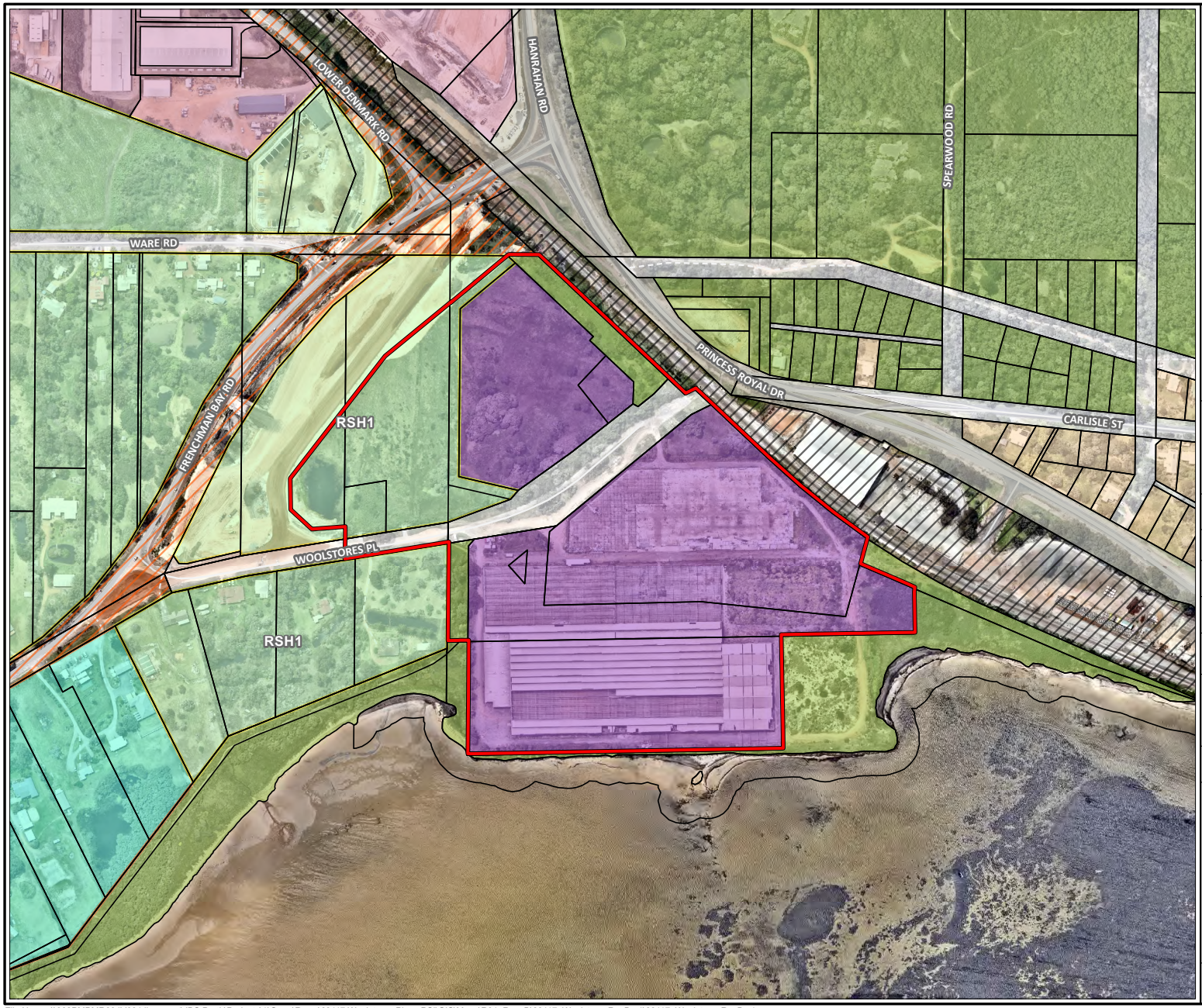
Coor. Sys. GDA 1994 MGA Zone 50

11 Lots, Woolstores Place Mt.Elphinstone, WA

SITE LAYOUT

FIGURE 2

File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\Rowe\63117 Woolstores Place PSI\GIS\Maps\R01_Rev_B\63117_02_SiteLayout.mxd
Image Reference: www.nearmap.com© - Imagery Date: 16 November 2022.



Legend

- Site boundary
- Cadastre Address (LGATE-002)

Local Planning Scheme - Zones and Reserves (DPLH-071)

- General industry
- Light industry
- Local road
- Major road
- Parks and recreation
- Priority road
- Rail
- Residential
- Rural small lot holdings
- Tourist residential
- Major road
- Minor road
- Tracks

strategen JBS&G

Job No: 63117

Client: Rowe Group

Version: A	Date: 10/02/2023
Drawn By: ianandagoda	Checked By: JN

Scale 1:5,000 at A4

0 50 100
metres

Coord. Sys. GDA 1994 MGA Zone 50

11 Lots, Woolstores Place Mt.Elphinstone, WA

SURROUNDING LAND USES

FIGURE 3

File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\Rowe\63117 Woolstores Place PSI\GIS\Maps\R01_Rev_B\63117_Woolstore_RevB-v1\63117_Woolstore_RevB-v1.aprx
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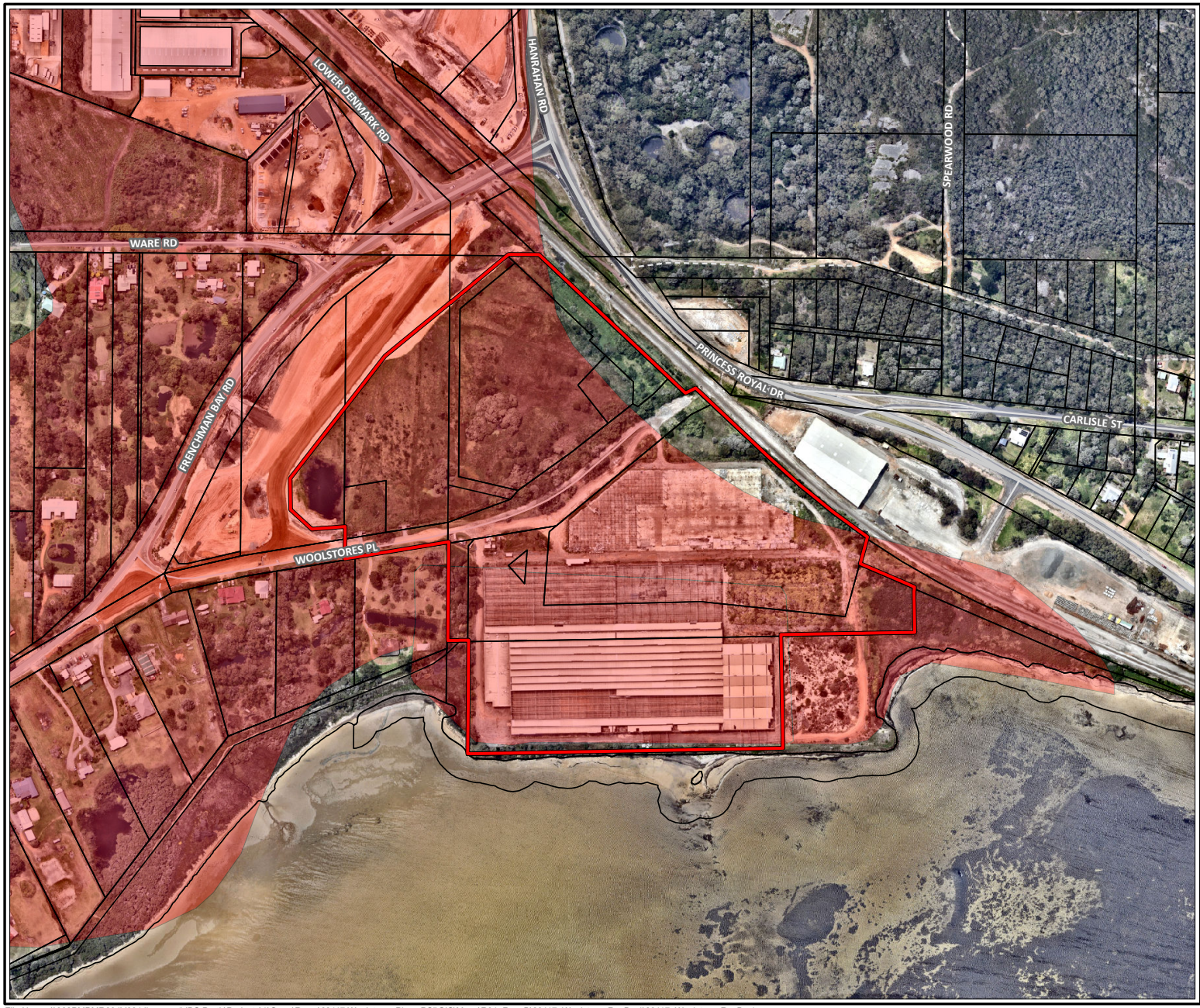

Legend

- Site boundary
- Cadastre Address (LGATE-002)

Acid Sulphate Risk Albany-Torbay (DWER-054)

- High to moderate risk
- Major road
- Minor road
- Tracks

strategen JBS&G

Job No: 63117	
Client: Rowe Group	
Version: A	Date: 10/02/2023
Drawn By: ianandagoda	Checked By: JN
Scale 1:5,000 at A4	

0 50 100
metres

Coord. Sys. GDA 1994 MGA Zone 50

11 Lots, Woolstores Place Mt.Elphinstone, WA

ACID SULFATE SOIL RISK MAPPING

FIGURE 4

File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\Rowe\63117 Woolstores Place PSI\GIS\Maps\R01_Rev_B\63117_Woolstore_RevB-v1\63117_Woolstore_RevB-v1.aprx
Image Reference: www.nearmap.com© - Imagery Date: 16 November 2022.

Legend

- Site boundary
- Cadastre Address (LGATE-002)

Aboriginal heritage places (DPLH-001)

- Other heritage place

Heritage Council WA - State Register (DPLH-006)

- Individual Place
- Major road
- Minor road
- Tracks

strategen JBS&G

Job No: 63117

Client: Rowe Group

Version: A	Date: 10/02/2023
Drawn By: ianandagoda	Checked By: JN

Scale 1:5,000 at A4

0 50 100
metres

Coord. Sys. GDA 1994 MGA Zone 50

11 Lots, Woolstores Place Mt.Elphinstone, WA

HERITAGE SITES

FIGURE 5

File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\Rowe\63117 Woolstores Place PSI\GIS\Maps\R01_Rev_B\63117_Woolstore_RevB-v1\63117_Woolstore_RevB-v1.aprx
Image Reference: www.nearmap.com© - Imagery Date: 16 November 2022.

Legend

- Site boundary
- Contaminated sites database (DWER-059)
  - Remediated for restricted use
- Major road
- Minor road
- Tracks

strategen JBS&G

Job No: 63117	
Client: Rowe Group	
Version: A	Date: 10/02/2023
Drawn By: ianandagoda	Checked By: JN
Scale 1:5,000 at A4	

0 50 100
metres

Coord. Sys. GDA 1994 MGA Zone 50

11 Lots, Woolstores Place Mt.Elphinstone, WA

CONTAMINATED SITES

FIGURE 6

File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\Rowe\63117 Woolstores Place PSI\GIS\Maps\R01_Rev_B\63117_Woolstore_RevB-v1\63117_Woolstore_RevB-v1.aprx
Image Reference: www.nearmap.com© - Imagery Date: 16 November 2022.

Appendix A Certificate of Title

REGISTER NUMBER	
1157/DP171141	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
2	**6/5/2004**

WESTERN AUSTRALIA

VOLUME **123** FOLIO **109A**

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

BGRoberts

REGISTRAR OF TITLES

REGISTRAR OF TITLES WESTERN AUSTRALIA

LAND DESCRIPTION:

LOT 1157 ON DEPOSITED PLAN 171141

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

MAINBEAM PTY LTD OF 15 BROCK STREET, PORT ADELAIDE, SOUTH AUSTRALIA
(T I817683) REGISTERED 12/3/2004

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

1. I847975 MORTGAGE TO SANDHURST TRUSTEES LTD REGISTERED 8/4/2004.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	123-109A (1157/DP171141)
PREVIOUS TITLE:	123-109A
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AUTHORITY:	CITY OF ALBANY

NOTE 1: A000001A LAND PARCEL IDENTIFIER OF ALBANY TOWN LOT/LOT 1157 (OR THE PART THEREOF) ON SUPERSEDED PAPER CERTIFICATE OF TITLE CHANGED TO LOT 1157 ON DEPOSITED PLAN 171141 ON 14-MAY-02 TO ENABLE ISSUE OF A DIGITAL CERTIFICATE OF TITLE.

NOTE 2: THE ABOVE NOTE MAY NOT BE SHOWN ON THE SUPERSEDED PAPER CERTIFICATE OF TITLE OR ON THE CURRENT EDITION OF DUPLICATE CERTIFICATE OF TITLE.

LANDGATE COPY OF ORIGINAL NOT TO SCALE 13/05/2022 04:59 PM Request number: 63591001

Landgate
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REGISTER NUMBER	
N/A	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
N/A	N/A

WESTERN AUSTRALIA

VOLUME 445 FOLIO 169A

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

BGRoberts
REGISTRAR OF TITLES

REGISTRAR OF TITLES WESTERN AUSTRALIA

THIS IS A MULTI-LOT TITLE

LAND DESCRIPTION:

LOT 895 ON DEPOSITED PLAN 161301
LOT 1104 ON DEPOSITED PLAN 165964
LOT 1209 ON DEPOSITED PLAN 173935

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

MAINBEAM PTY LTD OF 15 BROCK STREET, PORT ADELAIDE, SOUTH AUSTRALIA
(T I817683) REGISTERED 12/3/2004

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

1. T16935/1957 SUBJECT TO CERTAIN RESERVATIONS AS SET OUT IN TRANSFER 16935/1957 WHICH ARE IN ADDITION TO THOSE RESERVATIONS CONTAINED IN THE ORIGINAL GRANT. AS TO LOT 895 ON DP 161301 ONLY REGISTERED 7/11/1957.
2. I847975 MORTGAGE TO SANDHURST TRUSTEES LTD REGISTERED 8/4/2004.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	445-169A (895/DP161301), 445-169A (1104/DP165964), 445-169A (1209/DP173935)
PREVIOUS TITLE:	349-101A, 1207-631, 1245-637
PROPERTY STREET ADDRESS:	34 WOOLSTORES PL, MOUNT MELVILLE (895/DP161301). 34 WOOLSTORES PL, MOUNT MELVILLE (1209/DP173935).
LOCAL GOVERNMENT AUTHORITY:	CITY OF ALBANY

END OF PAGE 1 - CONTINUED OVER

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RECORD OF CERTIFICATE OF TITLE

REGISTER NUMBER: N/A VOLUME/FOLIO: 445-169A PAGE 2

NOTE 1:	L090466	DIAGRAM 73166 LODGED.
NOTE 2:		LAND PARCEL IDENTIFIER OF ALBANY TOWN LOT 895, ALBANY LOTS 1104 AND 1209 CHANGED TO LOT 895 ON DEPOSITED PLAN 161301, LOT 1104 ON DEPOSITED PLAN 165964 AND LOT 1209 ON DEPOSITED PLAN 173935 ON 1.10.2009 TO ENABLE ISSUE OF A DIGITAL CERTIFICATE OF TITLE.
NOTE 3:		THE ABOVE NOTE MAY NOT BE SHOWN ON THE SUPERSEDED PAPER CERTIFICATE OF TITLE OR ON THE CURRENT EDITION OF DUPLICATE CERTIFICATE OF TITLE.

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REGISTER NUMBER	
141/DP27076	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
2	**18/5/2004**

WESTERN AUSTRALIA

VOLUME **1133** FOLIO **829**

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

BGRoberts

REGISTRAR OF TITLES

REGISTRAR OF TITLES WESTERN AUSTRALIA

LAND DESCRIPTION:

LOT 141 ON DEPOSITED PLAN 27076

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

MAINBEAM PTY LTD OF 15 BROCK STREET, PORT ADELAIDE, SOUTH AUSTRALIA
(T I817683) REGISTERED 12/3/2004

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

1. I847975 MORTGAGE TO SANDHURST TRUSTEES LTD REGISTERED 8/4/2004.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	DP27076
PREVIOUS TITLE:	640-8
PROPERTY STREET ADDRESS:	23 WOOLSTORES PL, MOUNT ELPHINSTONE.
LOCAL GOVERNMENT AUTHORITY:	CITY OF ALBANY

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Landgate
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REGISTER NUMBER	
140/DP27076	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
2	**18/5/2004**

WESTERN AUSTRALIA

VOLUME **1290** FOLIO **605**

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

BGRoberts

REGISTRAR OF TITLES

REGISTRAR OF TITLES WESTERN AUSTRALIA

LAND DESCRIPTION:

LOT 140 ON DEPOSITED PLAN 27076

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

MAINBEAM PTY LTD OF 15 BROCK STREET, PORT ADELAIDE, SOUTH AUSTRALIA
(T I817683) REGISTERED 12/3/2004

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

1. I847975 MORTGAGE TO SANDHURST TRUSTEES LTD REGISTERED 8/4/2004.
2. *O905968 NOTICE OF INTENTION TO TAKE FOR THE DESIGNATED PURPOSE OF ALBANY RING ROAD STAGE 2. AS TO PORTION ONLY. REGISTERED 14/10/2021.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: DP27076
PREVIOUS TITLE: 640-8
PROPERTY STREET ADDRESS: 23 WOOLSTORES PL, MOUNT ELPHINSTONE.
LOCAL GOVERNMENT AUTHORITY: CITY OF ALBANY

NOTE 1: P065207 DEPOSITED PLAN 416233 LODGED

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www.landgate.wa.gov.au

REGISTER NUMBER	
11/D53535	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
1	**25/5/2015**

WESTERN AUSTRALIA

VOLUME **1492** FOLIO **23**

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

BGRoberts

REGISTRAR OF TITLES

REGISTRAR OF TITLES WESTERN AUSTRALIA

LAND DESCRIPTION:

LOT 11 ON DIAGRAM 53535

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

COMMISSIONER OF MAIN ROADS OF OF CARE OF DON AITKEN CENTRE WATERLOO CRESCENT EAST PERTH WA 6004

(TO O625734) REGISTERED 28/1/2021

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

1. *O625734 TAKING ORDER. THE DESIGNATED PURPOSE OF ALBANY RING ROAD, ALBANY REGISTERED 28/1/2021.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	1492-23 (11/D53535)
PREVIOUS TITLE:	1138-359
PROPERTY STREET ADDRESS:	15 WOOLSTORES PL, MOUNT ELPHINSTONE.
LOCAL GOVERNMENT AUTHORITY:	CITY OF ALBANY
RESPONSIBLE AGENCY:	MAIN ROADS WESTERN AUSTRALIA

NOTE 1: O625734 NO DUPLICATE TITLE ISSUED
NOTE 2: P065221 DEPOSITED PLAN 416232 LODGED

LANDGATE COPY OF ORIGINAL NOT TO SCALE 13/05/2022 04:59 PM Request number: 63591001

Landgate
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REGISTER NUMBER	
44/DP171141	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
N/A	**N/A**

WESTERN AUSTRALIA

VOLUME **LR3008** FOLIO **848**

RECORD OF QUALIFIED CERTIFICATE OF CROWN LAND TITLE

UNDER THE TRANSFER OF LAND ACT 1893
AND THE LAND ADMINISTRATION ACT 1997

NO DUPLICATE CREATED

The undermentioned land is Crown land in the name of the STATE OF WESTERN AUSTRALIA, subject to the interests and Status Orders shown in the first schedule which are in turn subject to the limitations, interests, encumbrances and notifications shown in the second schedule.

BG Roberts
REGISTRAR OF TITLES

REGISTRAR OF TITLES WESTERN AUSTRALIA

LAND DESCRIPTION:

LOT 44 ON DEPOSITED PLAN 171141

STATUS ORDER AND PRIMARY INTEREST HOLDER:
(FIRST SCHEDULE)

STATUS ORDER/INTEREST: UNALLOCATED CROWN LAND

PRIMARY INTEREST HOLDER: STATE OF WESTERN AUSTRALIA

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

Warning:
(1) A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required. Lot as described in the land description may be a lot or location.
(2) The land and interests etc. shown hereon may be affected by interests etc. that can be, but are not, shown on the register.
(3) The interests etc. shown hereon may have a different priority than shown.

----------END OF CERTIFICATE OF CROWN LAND TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	DP171141
PREVIOUS TITLE:	LR3008-833
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AUTHORITY:	CITY OF ALBANY
RESPONSIBLE AGENCY:	DEPARTMENT OF PLANNING, LANDS AND HERITAGE (SLSD)

LANDGATE COPY OF ORIGINAL NOT TO SCALE 13/05/2022 04:59 PM Request number: 63591001

Landgate
www.landgate.wa.gov.au

REGISTER NUMBER	
1350/DP184224	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
N/A	**N/A**

WESTERN AUSTRALIA

VOLUME **LR3009** FOLIO **754**

RECORD OF QUALIFIED CERTIFICATE OF CROWN LAND TITLE

UNDER THE TRANSFER OF LAND ACT 1893
AND THE LAND ADMINISTRATION ACT 1997

NO DUPLICATE CREATED

The undermentioned land is Crown land in the name of the STATE OF WESTERN AUSTRALIA, subject to the interests and Status Orders shown in the first schedule which are in turn subject to the limitations, interests, encumbrances and notifications shown in the second schedule.

BGRoberts
REGISTRAR OF TITLES

REGISTRAR OF TITLES WESTERN AUSTRALIA

LAND DESCRIPTION:

LOT 1350 ON DEPOSITED PLAN 184224

STATUS ORDER AND PRIMARY INTEREST HOLDER:
(FIRST SCHEDULE)

STATUS ORDER/INTEREST: RESERVE UNDER MANAGEMENT ORDER

PRIMARY INTEREST HOLDER: CITY OF ALBANY OF YORK STREET, ALBANY
(XE H678284) REGISTERED 26/2/2001

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

1. RESERVE 37011 FOR THE PURPOSE OF PARKING AND PROTECTION OF PUBLIC UTILITY SERVICES
H678284 MANAGEMENT ORDER. CONTAINS CONDITIONS TO BE OBSERVED. WITH POWER TO LEASE FOR ANY TERM NOT EXCEEDING 21 YEARS, SUBJECT TO THE CONSENT OF THE MINISTER FOR LANDS. REGISTERED 26/2/2001.

Warning:
(1) A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required. Lot as described in the land description may be a lot or location.
(2) The land and interests etc. shown hereon may be affected by interests etc. that can be, but are not, shown on the register.
(3) The interests etc. shown hereon may have a different priority than shown.

----------END OF CERTIFICATE OF CROWN LAND TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	LR3009-754 (1350/DP184224)
PREVIOUS TITLE:	LR3009-754
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AUTHORITY:	CITY OF ALBANY
RESPONSIBLE AGENCY:	DEPARTMENT OF PLANNING, LANDS AND HERITAGE (SLSD)

END OF PAGE 1 - CONTINUED OVER

LANDGATE COPY OF ORIGINAL NOT TO SCALE 13/05/2022 04:59 PM Request number: 63591001

Landgate
www.landgate.wa.gov.au

ORIGINAL CERTIFICATE OF CROWN LAND TITLE
QUALIFIED

REGISTER NUMBER: 1350/DP184224 VOLUME/FOLIO: LR3009-754 PAGE 2

NOTE 1: A000001A CORRESPONDENCE FILE 01886-1974-01RO.
NOTE 2: LAND PARCEL IDENTIFIER OF ALBANY TOWN LOT/LOT 1350 ON SUPERSEDED PAPER CERTIFICATE OF CROWN LAND TITLE CHANGED TO LOT 1350 ON DEPOSITED PLAN 184224 ON 16-AUG-02 TO ENABLE ISSUE OF A DIGITAL CERTIFICATE OF TITLE.
NOTE 3: THE ABOVE NOTE MAY NOT BE SHOWN ON THE SUPERSEDED PAPER CERTIFICATE OF TITLE.

LANDGATE COPY OF ORIGINAL NOT TO SCALE 13/05/2022 04:59 PM Request number: 63591001

Landgate
www.landgate.wa.gov.au

Appendix B Site Photographs

DRIVEWAY TO WAREHOUSES

DRIVEWAY TO WAREHOUSES

LAYDOWN AREA / HARDSTAND

HARDSTAND / BITUMEN

JBS&G

Job No: 63117	
Client: Rowe Property Group	
Version: Rev A	Date: 14/07/2022
Drawn By: PE	Checked By: JN
Not to Scale	
Coord. Sys n/a	

Woolstores Place PSI

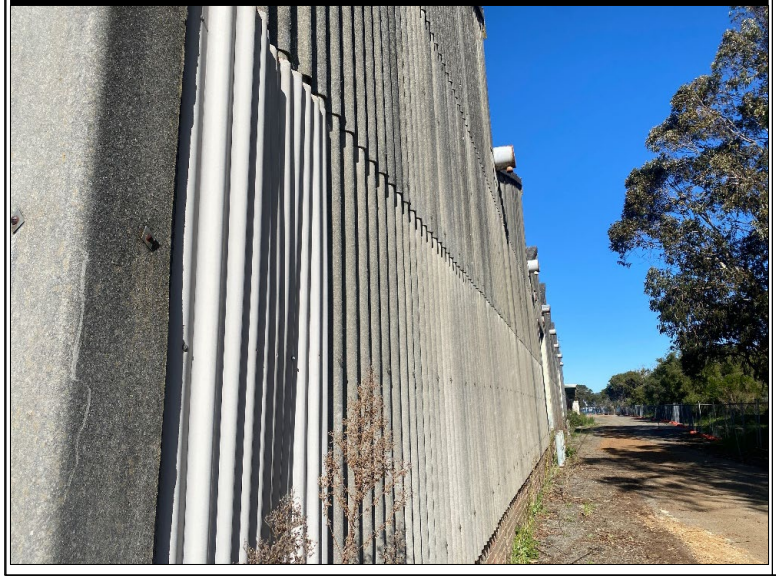
Various Lots on Woolstores Place and Mount Elphinstone

APPENDIX B

WAREHOUSE WITH PACM FENCING

WAREHOUSE WITH RAIL TRACK

PCAM FENCING



PCAM

JBS&G

Job No: 63117	
Client: Rowe Property Group	
Version: Rev A	Date: 14/07/2022
Drawn By: PE	Checked By: JN
Not to Scale	
Coord. Sys n/a	

Woolstores Place PSI

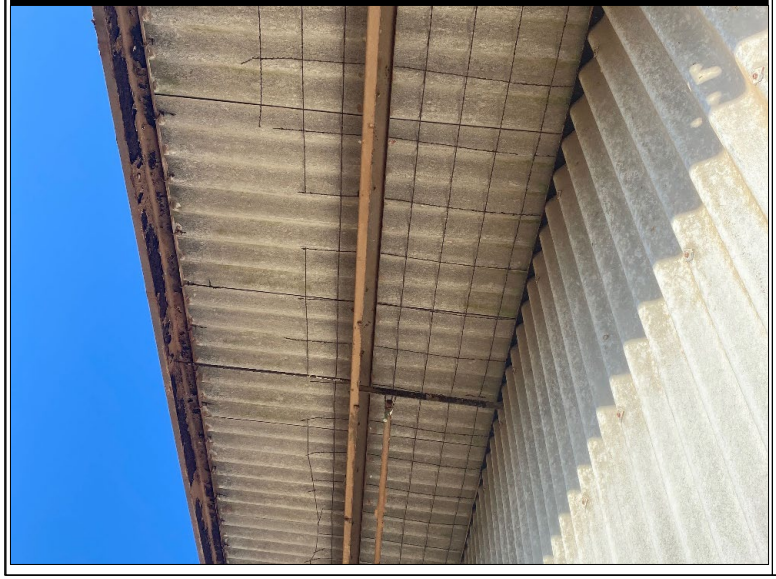
Various Lots on Woolstores Place and Mount Elphinstone

APPENDIX B

NON-PORTABLE WATER TANKS

SUMP AND RAIL TRACK

PACM ROOFING



POTENTIAL BROKEN ACM FENCING

JBS&G

Job No: 63117

Client: Rowe Property Group

Version: Rev A | Date: 14/07/2022

Drawn By: PE | Checked By: JN

Not to Scale

Coord. Sys n/a

Woolstores Place PSI

Various Lots on Woolstores Place and Mount Elphinstone

APPENDIX B

LANDFILL STOCKPILE

LANDFILL STOCKPILE

MONITORING WELL

PACM IN LANDFILL STOCKPILE

JBS&G

Job No: 63117	
Client: Rowe Property Group	
Version: Rev A	Date: 14/07/2022
Drawn By: PE	Checked By: JN
Not to Scale	
Coord. Sys n/a	

Woolstores Place PSI

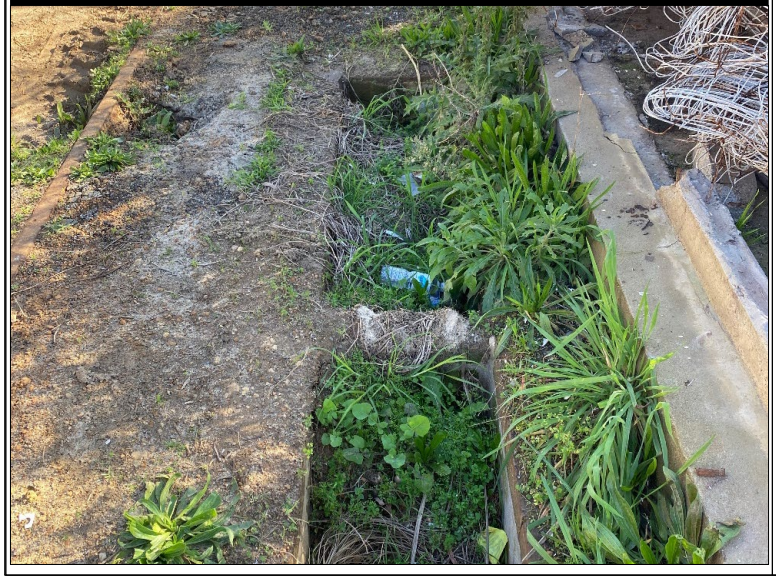
Various Lots on Woolstores Place and Mount Elphinstone

APPENDIX B

OUTDOOR OPEN WAREHOUSE

OUTSIDE WAREHOUSE

WASTE LAYDOWN



WASTE LAYDOWN

JBS&G

Job No: 63117

Client: Rowe Property Group

Version: Rev A	Date: 14/07/2022
Drawn By: PE	Checked By: JN

Not to Scale

Coord. Sys n/a

Woolstores Place PSI

Various Lots on Woolstores Place and Mount Elphinstone

APPENDIX B

WAREHOUSE PACM FENCING

LAYDOWN AREA

OUTDOOR OPEN WAREHOUSE LAYDOWN

HARDSTAND LAYDOWN AREA

JBS&G

Job No: 63117

Client: Rowe Property Group

Version: Rev A | Date: 14/07/2022

Drawn By: PE | Checked By: JN

Not to Scale

Coord. Sys n/a

Woolstores Place PSI

Various Lots on Woolstores Place and Mount Elphinstone

APPENDIX B

OUTDOOR LAYDOWN AREA

OUTDOOR LAYDOWN AREA

OUTDOOR LAYDOWN AREA

OUTDOOR LAYDOWN AREA / CRACKED BITUMEN

JBS&G

Job No: 63117	
Client: Rowe Property Group	
Version: Rev A	Date: 14/07/2022
Drawn By: PE	Checked By: JN
Not to Scale	
Coord. Sys n/a	

Woolstores Place PSI

Various Lots on Woolstores Place and Mount Elphinstone

APPENDIX B

HARDSTAND / WOODEN LAYDOWN AREA

LAYDOWN AREA

LAYDOWN AREA

TYRE WASTE

JBS&G

Job No: 63117	
Client: Rowe Property Group	
Version: Rev A	Date: 14/07/2022
Drawn By: PE	Checked By: JN
Not to Scale	
Coord. Sys n/a	

Woolstores Place PSI

Various Lots on Woolstores Place and Mount Elphinstone

APPENDIX B

PACM FENCING AND FILL

PACM FENCING AND FILL

FILL

FILL

JBS&G

Job No: 63117	
Client: Rowe Property Group	
Version: Rev A	Date: 14/07/2022
Drawn By: PE	Checked By: JN
Not to Scale	
Coord. Sys n/a	

Woolstores Place PSI

Various Lots on Woolstores Place and Mount Elphinstone

APPENDIX B

STOCKPILE FILL

STOCKPILE FILL

STOCKPILE FILL

STOCKPILE FILL

JBS&G

Job No: 63117

Client: Rowe Property Group

Version: Rev A | Date: 14/07/2022

Drawn By: PE | Checked By: JN

Not to Scale

Coord. Sys n/a

Woolstores Place PSI

Various Lots on Woolstores Place and Mount Elphinstone

APPENDIX B

STOCKPILE FILL AND PACM FENCING

STOCKPILE FILL

PACM FRAGMENTS

STOCKPILE FILL

JBS&G

Job No: 63117	
Client: Rowe Property Group	
Version: Rev A	Date: 14/07/2022
Drawn By: PE	Checked By: JN
Not to Scale	
Coord. Sys n/a	

Woolstores Place PSI

Various Lots on Woolstores Place and Mount Elphinstone

APPENDIX B

DIRT PATH TO OPEN WAREHOUSE

LAYDOWN WASTE

VEGETATED PATH

LAYDOWN WASTE

JBS&G

Job No: 63117	
Client: Rowe Property Group	
Version: Rev A	Date: 14/07/2022
Drawn By: PE	Checked By: JN
Not to Scale	
Coord. Sys n/a	

Woolstores Place PSI

Various Lots on Woolstores Place and Mount Elphinstone

APPENDIX B

LAYDOWN WASTE

LAYDOWN WASTE

LAYDOWN WASTE

LAYDOWN WASTE

JBS&G

Job No: 63117	
Client: Rowe Property Group	
Version: Rev A	Date: 14/07/2022
Drawn By: PE	Checked By: JN
Not to Scale	
Coord. Sys n/a	

Woolstores Place PSI

Various Lots on Woolstores Place and Mount Elphinstone

APPENDIX B

LAYDOWN WASTE

LAYDOWN WASTE

LAYDOWN WASTE / STOCKPILE WASTE

LAYDOWN WASTE

JBS&G

Job No: 63117	
Client: Rowe Property Group	
Version: Rev A	Date: 14/07/2022
Drawn By: PE	Checked By: JN
Not to Scale	
Coord. Sys n/a	

Woolstores Place PSI

Various Lots on Woolstores Place and Mount Elphinstone

APPENDIX B

PACM FENCING

WAREHOUSE STRUCTURE

STOCKPILE WASTE

STOCKPILE WASTE

JBS&G

Job No: 63117

Client: Rowe Property Group

Version: Rev A | Date: 14/07/2022

Drawn By: PE | Checked By: JN

Not to Scale

Coord. Sys n/a

Woolstores Place PSI

Various Lots on Woolstores Place and Mount Elphinstone

APPENDIX B

PACM FENCING AND ROOFING

PACM FENCING

STOCKPILE WASTE

INSIDE WAREHOUSE LAYDOWN

JBS&G

Job No: 63117	
Client: Rowe Property Group	
Version: Rev A	Date: 14/07/2022
Drawn By: PE	Checked By: JN
Not to Scale	
Coord. Sys n/a	

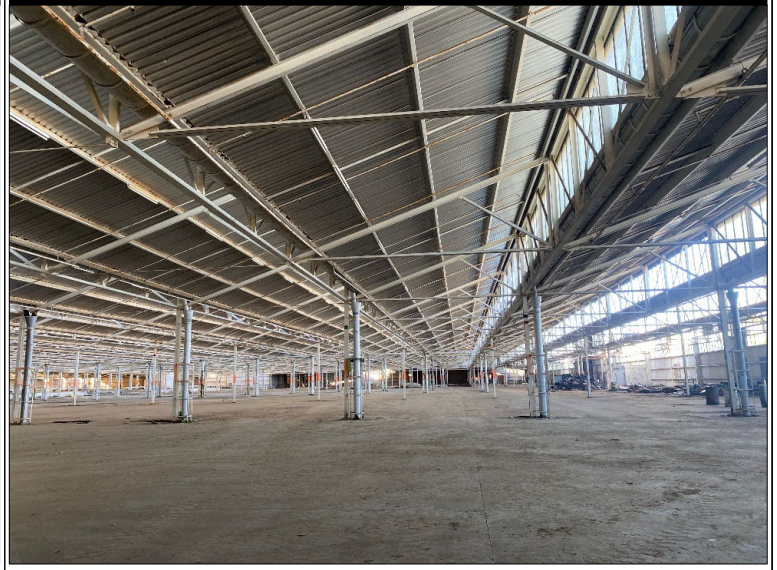
Woolstores Place PSI

Various Lots on Woolstores Place and Mount Elphinstone

APPENDIX B

INSIDE WAREHOUSE

INSIDE WAREHOUSE



INSIDE WAREHOUSE

WATER TANKS INSIDE WAREHOUSE

JBS&G

Job No: 63117

Client: Rowe Property Group

Version: Rev A	Date: 14/07/2022
Drawn By: PE	Checked By: JN

Not to Scale

Coord. Sys n/a

Woolstores Place PSI

Various Lots on Woolstores Place and Mount Elphinstone

APPENDIX B

LAYDOWN INSIDE WAREHOUSE

LAYDOWN INSIDE WAREHOUSE

AIR VENT INSIDE WAREHOUSE

LAYDOWN INSIDE WAREHOUSE

JBS&G

Job No: 63117	
Client: Rowe Property Group	
Version: Rev A	Date: 14/07/2022
Drawn By: PE	Checked By: JN
Not to Scale	
Coord. Sys n/a	

Woolstores Place PSI

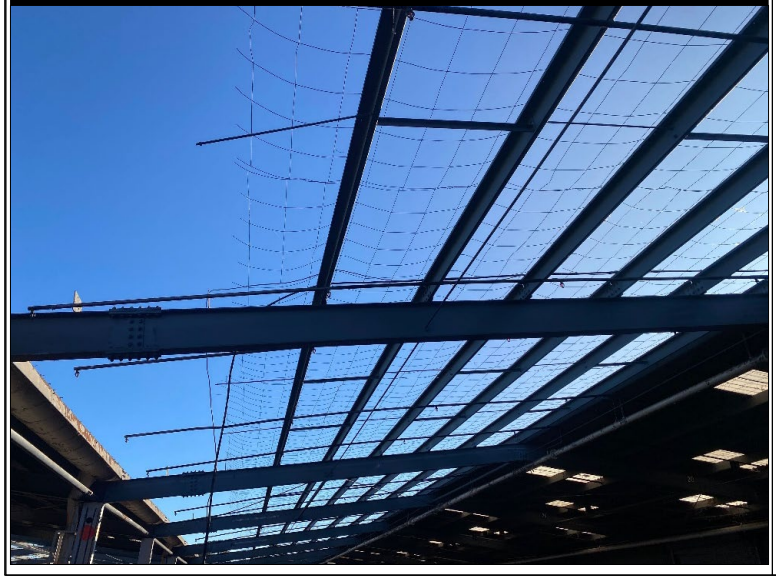
Various Lots on Woolstores Place and Mount Elphinstone

APPENDIX B

OUTSIDE WAREHOUSE WITH PACM FENCING

OUTSIDE WAREHOUSE METAL BEAMS

METALS BEAMS



VEGETATION OUTSIDE WAREHOUSE

JBS&G

Job No: 63117

Client: Rowe Property Group

Version: Rev A | Date: 14/07/2022

Drawn By: PE | Checked By: JN

Not to Scale

Coord. Sys n/a

Woolstores Place PSI

Various Lots on Woolstores Place and Mount Elphinstone

APPENDIX B

ALGAE WATERWAY

ALGAE WATERWAY

VEGETATED LOT

VEGETATED LOT NEXT TO ROAD

JBS&G

Job No: 63117

Client: Rowe Property Group

Version: Rev A | Date: 14/07/2022

Drawn By: PE | Checked By: JN

Not to Scale

Coord. Sys n/a

Woolstores Place PSI

Various Lots on Woolstores Place and Mount Elphinstone

APPENDIX B

Appendix C DWER Groundwater Information

Groundwater Map

INTRODUCTION

The *Perth Groundwater Map* has been designed to help water-bore drillers, irrigators, and private householders establish groundwater bores in the watertable (i.e. superficial) aquifer within the Perth metropolitan area. The aims of the Atlas are to provide information that:

- Indicates which areas are suitable/unsuitable for the development of a groundwater bore within the watertable (superficial) aquifer;
- Estimates the depth to the watertable beneath a property;
- Estimates the depth to the base of the watertable (superficial) aquifer beneath a property – this is the maximum allowable bore depth permitted for non-commercial use without an approved groundwater licence;
- Gives an indication of the salinity of the groundwater at the bore site.
-

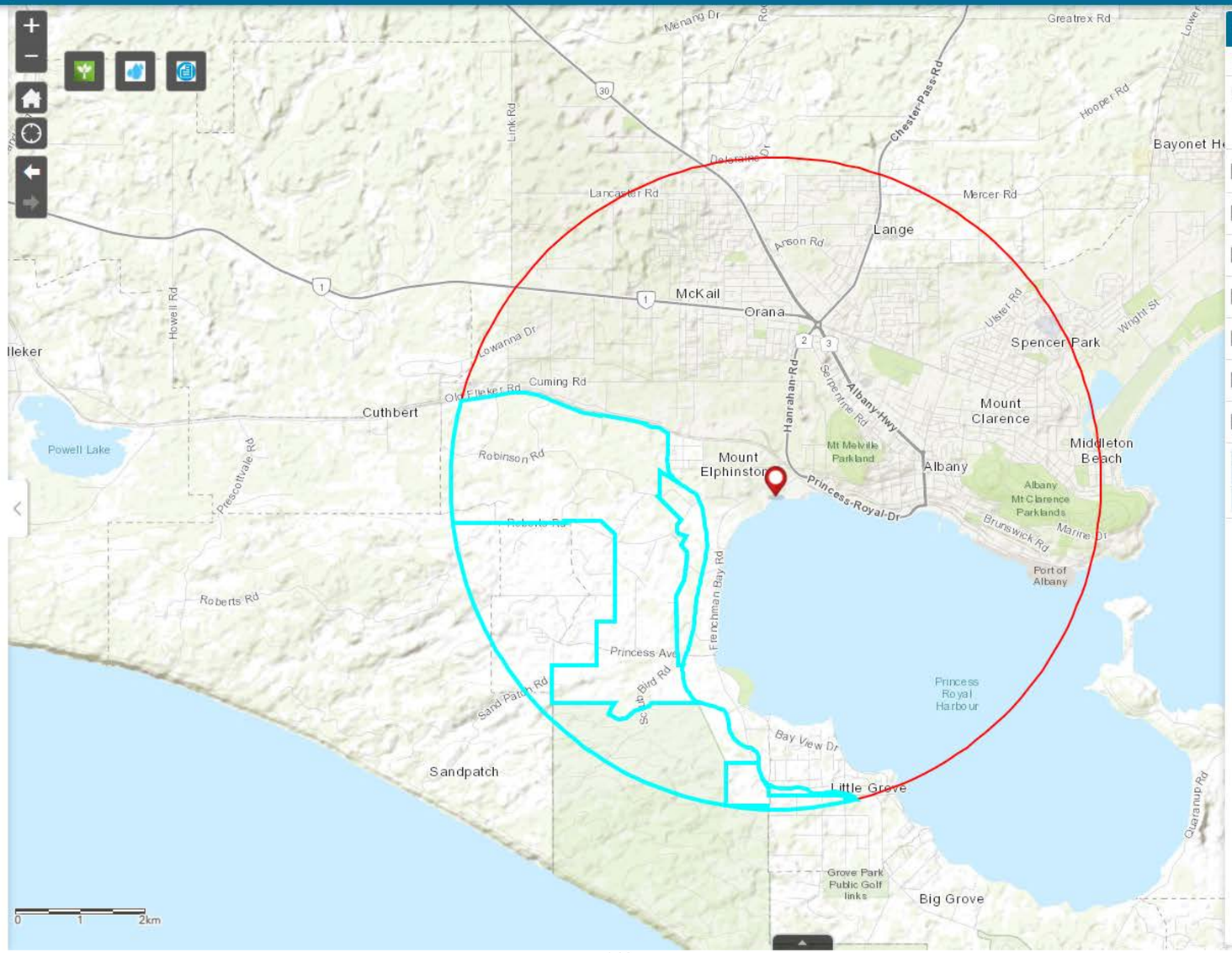
Garden Bore Suitability is a layer symbolised as follows:

Suitable
Unsuitable

To view the Department's policy on Garden Bores, click here.

Contact the Department

We want to hear what you have to say about the Groundwater Map. Please contact us to provide your feedback, and follow these links to review our disclaimer and accessibility statement. For technical information contact us via email: wir@dwer.wa.gov.au



Groundwater Report

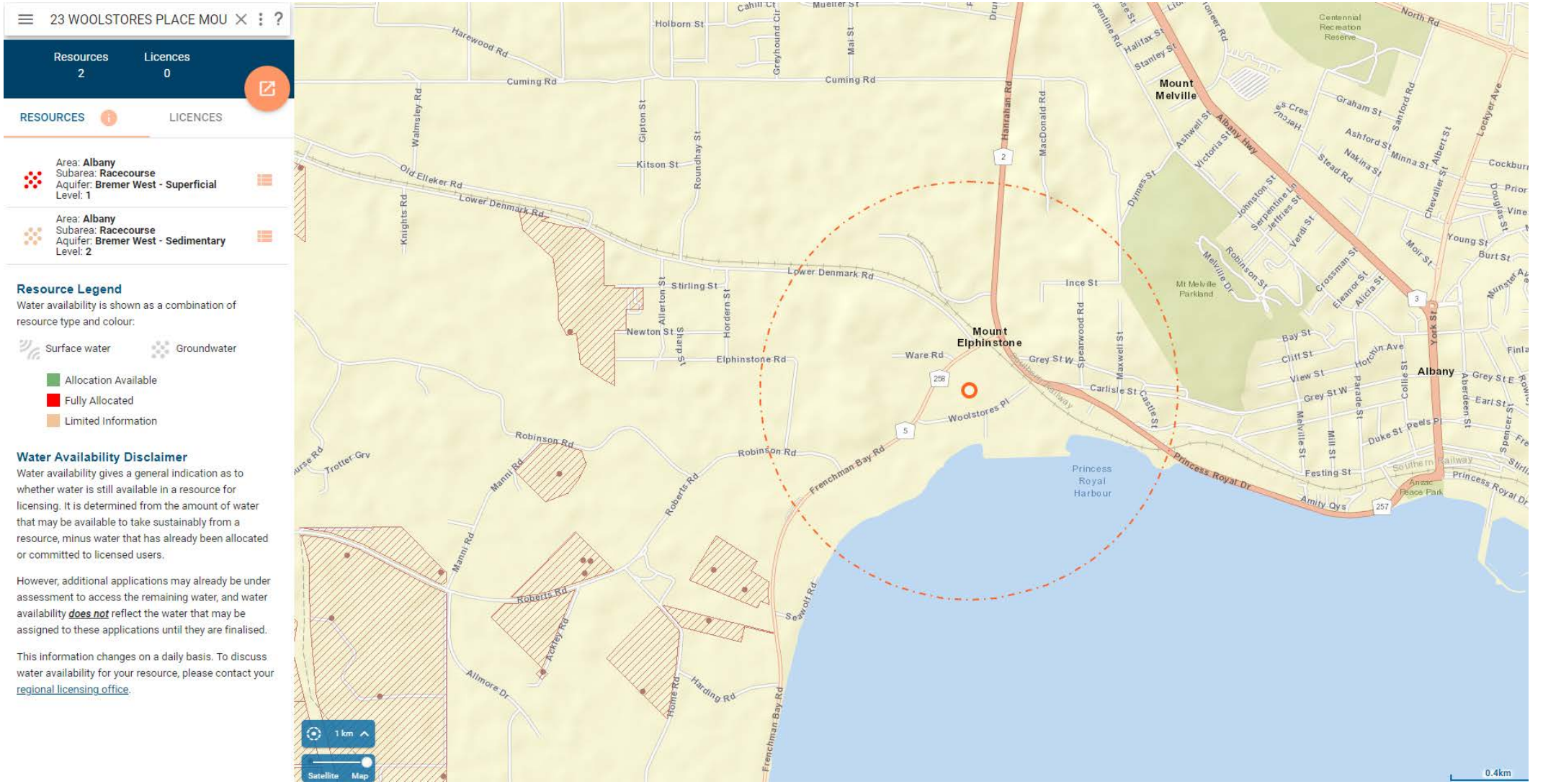
Report

Back — Area : 78,521,932.17 m²

- Depths (0)
- Groundwater Salinity (0)
- Surface Geology (0)
- Iron Staining Risk (0)
- Garden Bore Suitability (0)
- Acid Sulfate Soil Risk Map (0)
- **Public Drinking Water Source Areas (6)**

Public Drinking Water Source Areas (PDWSA): South Coast Water Reserve

Area: 18,973,826.02 m²


23 WOOLSTORES PLACE MOU
Resources
2
Licences
0
RESOURCES
LICENCES
Area: Albany
Subarea: Racecourse
Aquifer: Bremer West - Superficial
Level: 1
Area: Albany
Subarea: Racecourse
Aquifer: Bremer West - Sedimentary
Level: 2
Resource Legend
Water availability is shown as a combination of resource type and colour:
Surface water
Groundwater
Allocation Available
Fully Allocated
Limited Information
Water Availability Disclaimer
Water availability gives a general indication as to whether water is still available in a resource for licensing. It is determined from the amount of water that may be available to take sustainably from a resource, minus water that has already been allocated or committed to licensed users.
However, additional applications may already be under assessment to access the remaining water, and water availability does not reflect the water that may be assigned to these applications until they are finalised.
This information changes on a daily basis. To discuss water availability for your resource, please contact your regional licensing office.
Mount Melville
Mount Elphinstone
Albany
Princess Royal Harbour
Centennial Recreation Reserve
Mt Melville Parkland
Anzac Peace Park
Holborn St
Harewood Rd
Cuming Rd
Walmsley Rd
Gipton St
Kitson St
Roundhay St
Old Elleker Rd
Lower Denmark Rd
Knights Rd
Stirling St
Allerton St
Hordern St
Newton St
Shelton St
Elphinstone Rd
Ware Rd
Hanrahan Rd
MacDonald Rd
Ince St
Spearwood Rd
Maxwell St
Grey St W
Carlisle St
Castle St
Woolstores Pl
Frenchman Bay Rd
Robinson Rd
Trotter Grv
Manni Rd
Roberts Rd
Acorley Rd
Allmore Dr
Home Rd
Harding Rd
Seawolf Rd
Princess Royal Dr
Festing St
Amity Qys
Duke St
Peels Pl
Mill St
Melville St
Parade St
Collie St
Aberdeen St
Earl St
Bay St
Cliff St
View St
Hotchin Ave
York St
Albert St
Lockyer Ave
North Rd
Graham St
Sanford Rd
Ashford St
Minna St
Nakina St
Stead Rd
Ashwell St
Victoria St
Albany Hwy
Dynes St
Johnston St
Serpentine St
Jeffries St
Verdi St
Melville Dr
Robinson St
Crossman St
Eleanor St
Alicia St
Moir St
Young St
Burt St
Chevalier St
Douglas St
Cockburn
Prior
Vine
Munster Ave
Finla
Grey St E
Spencer St
Stirli
Southern Railway
1 km
Satellite
Map
0.4km

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: 26/05/2022

Site reference 60210112 - Munster Hill Catchment - MHC 9A - MHC 9A

Alternative Site References

Numbering System	Reference Code	Site Name	Short Name
AWRC	60210112	Munster Hill Catchment - MHC 9A	MHC 9A
WIN_ID	20083560		MHC 9A
AQWAB	2427-1-NW-0248	602 ALBANY COAST BASIN - MUNSTER HILL CATCHMENT - MHC 9A	MHC 9A

General Details

Site Type	Groundwater	**Sub Type**	Bore or Well	**Site Geofeature**	Ground
Northing	6124062	**Easting**	578594	**Zone**	50
Latitude	-35.023048552	**Longitude**	117.861515540	**Spheroid**	GDA94
Thou250 Map Index	SI5011	**Geographic Precision (+/- m)**	+/-5m		
Local Govt Authority	CITY OF ALBANY	**Locality**	MOUNT MELVILLE	**DWER Region**	South Coast
Catchment	Princess Royal Harbour	**Estuary**		**BOM Rainfall District**	9A - South Coast
River Basin	602 - Albany Coast	**Groundwater Area**	Karri	**Groundwater Province**	Bremer West
Surface Water Area	Albany Coast	**Surface Water SubArea**	Princess Royal Harbour	**GgStn Catchment Area(km2)**	N/A
Site Comment					

Depth Measurement Points (*Site reference: 60210112)*

Measurement Point Type	Elevation (m as per Datum Plane)	Datum	Measurement Method	Date	Comments
Ground level	10.2	AHD	Surveyed	16/03/1999	
Top of collar	10.2	AHD	Surveyed	16/03/1999	

Drilling - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: *26/05/2022*

Borehole Information (*Site reference: 60210112)*

Completed Date	25/11/1998	**Drill Method Name**	Direct push		
Owner Name	Department of Water	**Drill Rig Name**	Unknown		
Drill Company Name	Water and Rivers Commission	**Total Construction Depth (mbGL)**	5.5	**Depth Drilled (mbGL)**	5.5
Comments	Comment: Headwork details: gatic Log event: Core samples retrieved in 0.8m length core barrel				

Casing (*Site reference: 60210112)*

From (mbGL)	To (mbGL)	Element	Material	Inlet Type	Inside Dia. (mm)	Outside Dia. (mm)	Aperture (mm)	Comments
0.000	2.000	Casing	PVC	Not applicable	20.000			
2.000	5.500	Inlet (screen)	Unknown	Slotted				

Fill (*Site reference: 60210112)*

From (mbGL)	To (mbGL)	Fill Type	Material Type	Fill Volume (m3)	Grain Size (mm)
0.000	1.700	Void Fill	Unknown		
1.700	3.500	Annular Fill	Unknown		
3.500	5.500	Annular Fill	Unknown		

Aquifers - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: *26/05/2022*

Lithology Log *(Site reference: 60210112)*

From (mbGL)	To (mbGL)	Interpreted By	Substance	Lithological Description
0.000	0.800	Geologist--Internal staff	Soil	Top soil is gravel with lateritic pebbles
0.800	1.600	Geologist--Internal staff	Gravel	Gravel, orange-yellow-rusty brown (20); sand, white, medium (50)
1.600	2.400	Geologist--Internal staff	Sand	Sand, white, medium (60)
2.400	3.200	Geologist--Internal staff	Sand	Sand, white, medium to coarse, minor silty sand (50)
3.200	4.800	Geologist--Internal staff	Sand	Sand, brown, medium to coarse, minor fines (40)

Stratigraphy Log - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: 26/05/2022

Advanced Data Summary (*Site reference: 60210112 WIN Site ID: 60210112)*

Readings by Project

Default Site Reference	Project Code	Project Name	First Measurement	Last Measurement	No of Measurements
60210112	SC-G-MNSTRHLLCTMNT	Munster Hill Catchment GW Invstgn for AQWABase	17/03/1998	17/03/1998	2
60210112	SC-G-MNSTRHLLCTMNT	Munster Hill Catchment GW Invstgn for AQWABase	17/03/1998	17/03/1998	5

Readings by Data Category

Default Site Reference	Data Category	First Measurement	Last Measurement	No of Measurements
60210112	Water levels - discrete	17/03/1998	17/03/1998	2
60210112	Water quality indicators - discrete	17/03/1998	17/03/1998	5

Readings By Variable Type

Default Site Reference	Variable Type	First Measurement	Last Measurement	No of Measurements
60210112	Measurement or observation of physical properties	17/03/1998	17/03/1998	5
60210112	Water level (discrete)	17/03/1998	17/03/1998	2

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: 26/05/2022

Site reference 60210113 - Munster Hill Catchment - MHC 9B - MHC 9B

Alternative Site References

Numbering System	Reference Code	Site Name	Short Name
AWRC	60210113	Munster Hill Catchment - MHC 9B	MHC 9B
WIN_ID	20083561		MHC 9B
AQWAB	2427-1-NW-0249	602 ALBANY COAST BASIN - MUNSTER HILL CATCHMENT-MHC 9B	MHC 9B

General Details

Site Type	Groundwater	**Sub Type**	Bore or Well	**Site Geofeature**	Ground
Northing	6124061	**Easting**	578594	**Zone**	50
Latitude	-35.023057569	**Longitude**	117.861515634	**Spheroid**	GDA94
Thou250 Map Index	SI5011	**Geographic Precision (+/- m)**	+/-5m		
Local Govt Authority	CITY OF ALBANY	**Locality**	MOUNT MELVILLE	**DWER Region**	South Coast
Catchment	Princess Royal Harbour	**Estuary**		**BOM Rainfall District**	9A - South Coast
River Basin	602 - Albany Coast	**Groundwater Area**	Karri	**Groundwater Province**	Bremer West
Surface Water Area	Albany Coast	**Surface Water SubArea**	Princess Royal Harbour	**GgStn Catchment Area(km2)**	N/A
Site Comment					

Depth Measurement Points (*Site reference: 60210113)*

Measurement Point Type	Elevation (m as per Datum Plane)	Datum	Measurement Method	Date	Comments
Ground level	10.08	AHD	Surveyed	16/03/1999	
Top of collar	10.08	AHD	Surveyed	16/03/1999	

Drilling - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: *26/05/2022*

Borehole Information (*Site reference: 60210113)*

Completed Date	13/01/1999	**Drill Method Name**	Auger		
Owner Name	Department of Water	**Drill Rig Name**	Unknown		
Drill Company Name	Water and Rivers Commission	**Total Construction Depth (mbGL)**	9.8	**Depth Drilled (mbGL)**	9.8
Comments	Log event: Core samples retrieved in 0.8m length core barrel				

Casing (*Site reference: 60210113)*

From (mbGL)	To (mbGL)	Element	Material	Inlet Type	Inside Dia. (mm)	Outside Dia. (mm)	Aperture (mm)	Comments
0.000	6.000	Casing	PVC	Not applicable	20.000			
6.000	9.500	Casing	PVC	Not applicable	20.000			
9.500	9.800	Inlet (screen)	PVC	Slotted	20.000			

Fill (*Site reference: 60210113)*

From (mbGL)	To (mbGL)	Fill Type	Material Type	Fill Volume (m3)	Grain Size (mm)
0.000	6.600	Void Fill	Unknown		
6.600	9.200	Void Fill	Unknown		
9.200	9.500	Void Fill	Unknown		

Aquifers - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: *26/05/2022*

Lithology Log *(Site reference: 60210113)*

From (mbGL)	To (mbGL)	Interpreted By	Substance	Lithological Description
0.000	0.800	Geologist--Internal staff	Soil	Top soil is gravel with lateritic pebbles
0.800	1.600	Geologist--Internal staff	Gravel	Gravel, orange-yellow-rusty brown (20); sand, white, medium (50)
1.600	2.400	Geologist--Internal staff	Sand	Sand, white, medium (60)
2.400	3.200	Geologist--Internal staff	Sand	Sand, white, medium to coarse (30)
3.200	4.000	Geologist--Internal staff	Sand	Sand, white, medium to coarse, minor silty sand (50)
4.000	4.800	Geologist--Internal staff	Sand	Sand, brown, medium to coarse, minor fines (40)
4.800	5.600	Geologist--Internal staff	Unknown	-
5.600	6.400	Geologist--Internal staff	Unknown	-
6.400	7.200	Geologist--Internal staff	Unknown	-
7.200	8.000	Geologist--Internal staff	Sand	Sand, brown, medium (25)
8.000	8.800	Geologist--Internal staff	Unknown	-
8.800	9.600	Geologist--Internal staff	Sand	Sand, grey, medium to coarse, minor fines (30); silty clay, tan-light grey, minor micas, minor gravels (10)

Stratigraphy Log - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: 26/05/2022

Advanced Data Summary (*Site reference: 60210113 WIN Site ID: 60210113)*

Readings by Project

Default Site Reference	Project Code	Project Name	First Measurement	Last Measurement	No of Measurements
60210113	SC-G-MNSTRHLLCTMNT	Munster Hill Catchment GW Invstgn for AQWABase	17/03/1999	17/03/1999	2
60210113	SC-G-MNSTRHLLCTMNT	Munster Hill Catchment GW Invstgn for AQWABase	17/03/1999	17/03/1999	5

Readings by Data Category

Default Site Reference	Data Category	First Measurement	Last Measurement	No of Measurements
60210113	Water levels - discrete	17/03/1999	17/03/1999	2
60210113	Water quality indicators - discrete	17/03/1999	17/03/1999	5

Readings By Variable Type

Default Site Reference	Variable Type	First Measurement	Last Measurement	No of Measurements
60210113	Measurement or observation of physical properties	17/03/1999	17/03/1999	5
60210113	Water level (discrete)	17/03/1999	17/03/1999	2

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: 26/05/2022

Site reference 60210114 - Munster Hill Catchment - MHC 9C - MHC 9C

Alternative Site References

Numbering System	Reference Code	Site Name	Short Name
AWRC	60210114	Munster Hill Catchment - MHC 9C	MHC 9C
WIN_ID	20083562		MHC 9C
AQWAB	2427-1-NW-0250	602 ALBANY COAST BASIN - MUNSTER HILL CATCHMENT-MHC 9C	MHC 9C

General Details

Site Type	Groundwater	**Sub Type**	Bore or Well	**Site Geofeature**	Ground
Northing	6124063	**Easting**	578594	**Zone**	50
Latitude	-35.023039536	**Longitude**	117.861515445	**Spheroid**	GDA94
Thou250 Map Index	SI5011	**Geographic Precision (+/- m)**	+/-5m		
Local Govt Authority	CITY OF ALBANY	**Locality**	MOUNT MELVILLE	**DWER Region**	South Coast
Catchment	Princess Royal Harbour	**Estuary**		**BOM Rainfall District**	9A - South Coast
River Basin	602 - Albany Coast	**Groundwater Area**	Karri	**Groundwater Province**	Bremer West
Surface Water Area	Albany Coast	**Surface Water SubArea**	Princess Royal Harbour	**GgStn Catchment Area(km2)**	N/A
Site Comment					

Depth Measurement Points (*Site reference: 60210114)*

Measurement Point Type	Elevation (m as per Datum Plane)	Datum	Measurement Method	Date	Comments
Ground level	10.28	AHD	Surveyed	16/03/1999	
Top of collar	11.03	AHD	Surveyed	16/03/1999	

Drilling - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: *26/05/2022*

Borehole Information (*Site reference: 60210114)*

Completed Date	17/11/1998	**Drill Method Name**	Auger		
Owner Name	Department of Water	**Drill Rig Name**	Unknown		
Drill Company Name	Water and Rivers Commission	**Total Construction Depth (mbGL)**	15.2	**Depth Drilled (mbGL)**	15.2
Comments	Comment: Headwork details: standpipe (0.75m) Log event: Core samples retrieved in 0.8m length core barrel				

Casing (*Site reference: 60210114)*

From (mbGL)	To (mbGL)	Element	Material	Inlet Type	Inside Dia. (mm)	Outside Dia. (mm)	Aperture (mm)	Comments
0.000	12.400	Casing	PVC	Not applicable	20.000			
12.400	13.700	Inlet (screen)	PVC	Slotted	20.000			
13.700	15.200	Casing	PVC	Not applicable				

Fill (*Site reference: 60210114)*

From (mbGL)	To (mbGL)	Fill Type	Material Type	Fill Volume (m3)	Grain Size (mm)
0.000	12.400	Void Fill	Unknown		
12.400	15.200	Void Fill	Unknown		

Aquifers - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: *26/05/2022*

Lithology Log *(Site reference: 60210114)*

From (mbGL)	To (mbGL)	Interpreted By	Substance	Lithological Description
0.000	0.800	Geologist--Internal staff	Soil	Top soil is gravel with lateritic pebbles
0.800	1.600	Geologist--Internal staff	Gravel	Gravel, orange-yellow-rusty brown (20); sand, white, medium (50)
1.600	2.400	Geologist--Internal staff	Sand	Sand, white, medium (60)
2.400	3.200	Geologist--Internal staff	Sand	Sand, white, medium to coarse (30)
3.200	4.000	Geologist--Internal staff	Sand	Sand, white, medium to coarse, minor silty sand (50)
4.000	4.800	Geologist--Internal staff	Sand	Sand, brown, medium to coarse, minor fines (40)
4.800	5.600	Geologist--Internal staff	Unknown	-
5.600	6.400	Geologist--Internal staff	Unknown	-
6.400	7.200	Geologist--Internal staff	Unknown	-
7.200	8.000	Geologist--Internal staff	Sand	Sand, brown, medium (25)
8.000	8.800	Geologist--Internal staff	Unknown	-
8.800	9.600	Geologist--Internal staff	Sand	Sand, grey, medium to coarse, minor fines (30); silty clay, tan-light grey, minor micas, minor gravels (10)
9.600	10.400	Geologist--Internal staff	Clay	Silty clay, tan-light grey, minor micas, minor gravels, minor angular quartz pebbles (80)
10.400	11.200	Geologist--Internal staff	Clay	Silty clay, tan-light grey, minor micas, minor gravels, minor angular quartz pebbles (55); silty clay, black-dark brown-white-dark, minor gravels, angular quartz pebbles, fresh to weathered feldspars, micaceous (25) to weathered granite
11.200	12.000	Geologist--Internal staff	Clay	Silty clay, black-dark brown-white-dark grey, minor gravels, angular quartz pebbles, fresh to weatherd feldspars, micaceous (80) to weathered granite
12.000	12.800	Geologist--Internal staff	Clay	Silty clay, black-dark brown-white-dark grey, minor gravels, angular quartz pebbles, fresh to weathered feldspars, micaceous (20); clayey fine sand, micaceous (60) to weathered granite
12.800	13.600	Geologist--Internal staff	Sand	Silty sand, green-grey, micaceous (80) to weathered granite
13.600	14.400	Geologist--Internal staff	Sand	Silty sand, green-grey, micaceous (10); clayey fine sand, micaceous (50) to weathered granite
14.400	15.200	Geologist--Internal staff	Gravel	Clayey gravels, light grey-white-light green, coarse to very coarse, angular to sub-angular, quartz (80) to weathered granite

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: 26/05/2022

Stratigraphy Log - No Data Available

Advanced Data Summary (*Site reference: 60210114 WIN Site ID: 60210114)*

Readings by Project

Default Site Reference	Project Code	Project Name	First Measurement	Last Measurement	No of Measurements
60210114	SC-G-MNSTRHLLCTMNT	Munster Hill Catchment GW Invstgn for AQWABase	17/03/1999	17/03/1999	2

Readings by Data Category

Default Site Reference	Data Category	First Measurement	Last Measurement	No of Measurements
60210114	Water levels - discrete	17/03/1999	17/03/1999	2

Readings By Variable Type

Default Site Reference	Variable Type	First Measurement	Last Measurement	No of Measurements
60210114	Water level (discrete)	17/03/1999	17/03/1999	2

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: 26/05/2022

Site reference 60210115 - Munster Hill Catchment - MHC 10A - MHC 10A

Alternative Site References

Numbering System	Reference Code	Site Name	Short Name
AWRC	60210115	Munster Hill Catchment - MHC 10A	MHC 10A
WIN_ID	20083564		MHC 10A
AQWAB	2427-1-NW-0251	602 ALBANY COAST BASIN - MUNSTER HILL CATCHMENT - MHC 10A	MHC 10A

General Details

Site Type	Groundwater	**Sub Type**	Bore or Well	**Site Geofeature**	Ground
Northing	6123804	**Easting**	578445	**Zone**	50
Latitude	-35.025386379	**Longitude**	117.859906760	**Spheroid**	GDA94
Thou250 Map Index	SI5011	**Geographic Precision (+/- m)**	+/-5m		
Local Govt Authority	CITY OF ALBANY	**Locality**	MOUNT ELPHINSTONE	**DWER Region**	South Coast
Catchment	Princess Royal Harbour	**Estuary**		**BOM Rainfall District**	9A - South Coast
River Basin	602 - Albany Coast	**Groundwater Area**	Albany	**Groundwater Province**	Bremer West
Surface Water Area	Albany Coast	**Surface Water SubArea**	Princess Royal Harbour	**GgStn Catchment Area(km2)**	N/A
Site Comment					

Depth Measurement Points (*Site reference: 60210115)*

Measurement Point Type	Elevation (m as per Datum Plane)	Datum	Measurement Method	Date	Comments
Ground level	2.5	AHD	Surveyed	16/03/1999	
Top of collar	2.5	AHD	Surveyed	16/03/1999	

Drilling - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: *26/05/2022*

Borehole Information (*Site reference: 60210115)*

Completed Date	16/11/1998	**Drill Method Name**	Direct push		
Owner Name	Department of Water	**Drill Rig Name**	Unknown		
Drill Company Name	Water and Rivers Commission	**Total Construction Depth (mbGL)**	4	**Depth Drilled (mbGL)**	4
Comments	Comment: Headwork details: gatic Log event: Core samples retrieved in 0.8m length core barrel				

Casing (*Site reference: 60210115)*

From (mbGL)	To (mbGL)	Element	Material	Inlet Type	Inside Dia. (mm)	Outside Dia. (mm)	Aperture (mm)	Comments
0.000	1.000	Casing	PVC	Not applicable	20.000			
1.000	4.000	Inlet (screen)	Unknown	Slotted	20.000			

Fill (*Site reference: 60210115)*

From (mbGL)	To (mbGL)	Fill Type	Material Type	Fill Volume (m3)	Grain Size (mm)
0.000	0.800	Void Fill	Unknown		
0.800	4.000	Void Fill	Unknown		

Aquifers - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: *26/05/2022*

Lithology Log *(Site reference: 60210115)*

From (mbGL)	To (mbGL)	Interpreted By	Substance	Lithological Description
0.000	0.800	Geologist--Internal staff	Sand	Silty sand, black-light grey (30)
0.800	1.600	Geologist--Internal staff	Sand	Sand, light grey, medium (35)
1.600	2.400	Geologist--Internal staff	Sand	Sand, light grey-rusty brown, medium (20); silty sand, rusty brown(40)
2.400	3.200	Geologist--Internal staff	Sand	Sand, rusty brown, coarse (35)
3.200	4.000	Geologist--Internal staff	Sand	Sand, brown, medium to coarse (70)

Stratigraphy Log - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: 26/05/2022

Advanced Data Summary (*Site reference: 60210115 WIN Site ID: 60210115)*

Readings by Project

Default Site Reference	Project Code	Project Name	First Measurement	Last Measurement	No of Measurements
60210115	SC-G-MNSTRHLLCTMNT	Munster Hill Catchment GW Invstgn for AQWABase	19/03/1999	19/03/1999	2
60210115	SC-G-MNSTRHLLCTMNT	Munster Hill Catchment GW Invstgn for AQWABase	19/03/1999	19/03/1999	5

Readings by Data Category

Default Site Reference	Data Category	First Measurement	Last Measurement	No of Measurements
60210115	Water levels - discrete	19/03/1999	19/03/1999	2
60210115	Water quality indicators - discrete	19/03/1999	19/03/1999	5

Readings By Variable Type

Default Site Reference	Variable Type	First Measurement	Last Measurement	No of Measurements
60210115	Measurement or observation of physical properties	19/03/1999	19/03/1999	5
60210115	Water level (discrete)	19/03/1999	19/03/1999	2

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: 26/05/2022

Site reference 60210116 - Munster Hill Catchment - MHC 10B - MHC 10B

Alternative Site References

Numbering System	Reference Code	Site Name	Short Name
AWRC	60210116	Munster Hill Catchment - MHC 10B	MHC 10B
WIN_ID	20083566		MHC 10B
AQWAB	2427-1-NW-0252	602 ALBANY COAST BASIN - MUNSTER HILL CATCHMENT-MHC 10B	MHC 10B

General Details

Site Type	Groundwater	**Sub Type**	Bore or Well	**Site Geofeature**	Ground
Northing	6123803	**Easting**	578446	**Zone**	50
Latitude	-35.025395318	**Longitude**	117.859917816	**Spheroid**	GDA94
Thou250 Map Index	SI5011	**Geographic Precision (+/- m)**	+/-5m		
Local Govt Authority	CITY OF ALBANY	**Locality**	MOUNT ELPHINSTONE	**DWER Region**	South Coast
Catchment	Princess Royal Harbour	**Estuary**		**BOM Rainfall District**	9A - South Coast
River Basin	602 - Albany Coast	**Groundwater Area**	Albany	**Groundwater Province**	Bremer West
Surface Water Area	Albany Coast	**Surface Water SubArea**	Princess Royal Harbour	**GgStn Catchment Area(km2)**	N/A
Site Comment					

Depth Measurement Points (*Site reference: 60210116)*

Measurement Point Type	Elevation (m as per Datum Plane)	Datum	Measurement Method	Date	Comments
Ground level	2.46	AHD	Surveyed	16/03/1999	

Drilling - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: *26/05/2022*

Borehole Information (*Site reference: 60210116)*

Completed Date	13/01/1999	**Drill Method Name**	Direct push		
Owner Name	Department of Water	**Drill Rig Name**	Unknown		
Drill Company Name	Water and Rivers Commission	**Total Construction Depth (mbGL)**	8.3	**Depth Drilled (mbGL)**	8.3
Comments	Comment: Headwork details: gatic Log event: Core samples retrieved in 0.8m length core barrel				

Casing (*Site reference: 60210116)*

From (mbGL)	To (mbGL)	Element	Material	Inlet Type	Inside Dia. (mm)	Outside Dia. (mm)	Aperture (mm)	Comments
0.000	5.000	Casing	PVC	Not applicable	20.000			
5.000	8.300	Inlet (screen)	Unknown	Slotted	20.000			

Fill (*Site reference: 60210116)*

From (mbGL)	To (mbGL)	Fill Type	Material Type	Fill Volume (m3)	Grain Size (mm)
0.000	4.700	Void Fill	Unknown		
4.700	5.100	Void Fill	Unknown		
5.100	8.300	Void Fill	Unknown		

Aquifers - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: 26/05/2022

Lithology Log *(Site reference: 60210116)*

From (mbGL)	To (mbGL)	Interpreted By	Substance	Lithological Description
0.000	0.800	Geologist--Internal staff	Sand	Silty sand, black-light grey (30)
0.800	1.600	Geologist--Internal staff	Sand	Sand, light grey, medium (35)
1.600	2.400	Geologist--Internal staff	Sand	Sand, light grey-rusty brown, medium (20); silty sand, rusty brown(40)
2.400	3.200	Geologist--Internal staff	Sand	Sand, rusty brown, coarse (35)
3.200	4.000	Geologist--Internal staff	Sand	Sand, brown, medium to coarse (70)
4.000	4.800	Geologist--Internal staff	Sand	Gravelly sand, brown, fine to very coarse (20); silty gravels, light grey-light blue (40)
4.800	5.600	Geologist--Internal staff	Sand	Sand, white-light grey, coarse to very coarse, minor angular, pebbles (60)
5.600	6.400	Geologist--Internal staff	Sand	Sand, white-light grey, coarse to very coarse, minor, angular, pebbles (70)
6.400	7.200	Geologist--Internal staff	Sand	Sand, white-light grey, coarse to very coarse, minor, angular, pebbles (50); sand, white-light grey, medium to very coarse, minor fines (30)
7.200	8.000	Geologist--Internal staff	Unknown	-
8.000	8.300	Geologist--Internal staff	Clay	Sandy clay, light grey-light brown, micaceous

Stratigraphy Log - No Data Available

Advanced Data Summary - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: 26/05/2022

Site reference 60210117 - Munster Hill Catchment - MHC 10C - MHC 10C

Alternative Site References

Numbering System	Reference Code	Site Name	Short Name
AWRC	60210117	Munster Hill Catchment - MHC 10C	MHC 10C
WIN_ID	20083567		MHC 10C
AQWAB	2427-1-NW-0253	602 ALBANY COAST BASIN - MUNSTER HILL CATCHMENT-MHC 10C	MHC 10C

General Details

Site Type	Groundwater	**Sub Type**	Bore or Well	**Site Geofeature**	Ground
Northing	6123803	**Easting**	578445	**Zone**	50
Latitude	-35.025395396	**Longitude**	117.859906855	**Spheroid**	GDA94
Thou250 Map Index	SI5011	**Geographic Precision (+/- m)**	+/-5m		
Local Govt Authority	CITY OF ALBANY	**Locality**	MOUNT ELPHINSTONE	**DWER Region**	South Coast
Catchment	Princess Royal Harbour	**Estuary**		**BOM Rainfall District**	9A - South Coast
River Basin	602 - Albany Coast	**Groundwater Area**	Albany	**Groundwater Province**	Bremer West
Surface Water Area	Albany Coast	**Surface Water SubArea**	Princess Royal Harbour	**GgStn Catchment Area(km2)**	N/A
Site Comment					

Depth Measurement Points (*Site reference: 60210117)*

Measurement Point Type	Elevation (m as per Datum Plane)	Datum	Measurement Method	Date	Comments
Ground level	2.47	AHD	Surveyed	16/03/1999	
Top of collar	2.47	AHD	Surveyed	16/03/1999	

Drilling - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: *26/05/2022*

Borehole Information (*Site reference: 60210117)*

Completed Date	12/01/1999	**Drill Method Name**	Auger		
Owner Name	Department of Water	**Drill Rig Name**	Unknown		
Drill Company Name	Water and Rivers Commission	**Total Construction Depth (mbGL)**	11.2	**Depth Drilled (mbGL)**	11.2
Comments	Comment: Headwork details: gatic Log event: Core samples retrieved in 0.8m length core barrel				

Casing (*Site reference: 60210117)*

From (mbGL)	To (mbGL)	Element	Material	Inlet Type	Inside Dia. (mm)	Outside Dia. (mm)	Aperture (mm)	Comments
0.000	10.400	Casing	PVC	Not applicable	20.000			
10.400	11.200	Inlet (screen)	Unknown	Slotted	20.000			

Fill (*Site reference: 60210117)*

From (mbGL)	To (mbGL)	Fill Type	Material Type	Fill Volume (m3)	Grain Size (mm)
0.000	9.800	Void Fill	Unknown		
9.800	11.200	Void Fill	Unknown		

Aquifers - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: 26/05/2022

Lithology Log *(Site reference: 60210117)*

From (mbGL)	To (mbGL)	Interpreted By	Substance	Lithological Description
0.000	0.800	Geologist--Internal staff	Sand	Silty sand, black-light grey (30)
0.800	1.600	Geologist--Internal staff	Sand	Sand, light grey, medium (35)
1.600	2.400	Geologist--Internal staff	Sand	Sand, light grey-rusty brown, medium (20); silty sand, rusty brown(40)
2.400	3.200	Geologist--Internal staff	Sand	Sand, rusty brown, coarse (35)
3.200	4.000	Geologist--Internal staff	Sand	Sand, brown, medium to coarse (70)
4.000	4.800	Geologist--Internal staff	Sand	Gravelly sand, brown, fine to very coarse (20); silty gravels, light grey-light blue (40)
4.800	5.600	Geologist--Internal staff	Sand	Sand, white-light grey, coarse to very coarse, minor angular, pebbles (60)
5.600	6.400	Geologist--Internal staff	Sand	Sand, white-light grey, coarse to very coarse, minor, angular, pebbles (70)
6.400	7.200	Geologist--Internal staff	Sand	Sand, white-light grey, coarse to very coarse, minor, angular, pebbles (50); sand, white-light grey, medium to very coarse, minor fines (30)
7.200	8.000	Geologist--Internal staff	Unknown	-
8.000	8.800	Geologist--Internal staff	Clay	Sandy clay, light grey-light brown, micaceous
8.800	9.600	Geologist--Internal staff	Clay	Sandy clay, ligh grey-light brown, micaceous (80)
9.600	10.400	Geologist--Internal staff	Clay	Sandy clay, light grey-light brown, micaceous (80)
10.400	11.200	Geologist--Internal staff	Unknown	-

Stratigraphy Log - No Data Available

Advanced Data Summary - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: 26/05/2022

Site reference 60210118 - Munster Hill Catchment - MHC 10D - MHC 10D

Alternative Site References

Numbering System	Reference Code	Site Name	Short Name
AWRC	60210118	Munster Hill Catchment - MHC 10D	MHC 10D
WIN_ID	20083568		MHC 10D
AQWAB	2427-1-NW-0254	602 ALBANY COAST BASIN - MUNSTER HILL CATCHMENT-MHC 10D	MHC 10D

General Details

Site Type	Groundwater	**Sub Type**	Bore or Well	**Site Geofeature**	Ground
Northing	6123802	**Easting**	578444	**Zone**	50
Latitude	-35.025404490	**Longitude**	117.859895988	**Spheroid**	GDA94
Thou250 Map Index	SI5011	**Geographic Precision (+/- m)**	+/-5m		
Local Govt Authority	CITY OF ALBANY	**Locality**	MOUNT ELPHINSTONE	**DWER Region**	South Coast
Catchment	Princess Royal Harbour	**Estuary**		**BOM Rainfall District**	9A - South Coast
River Basin	602 - Albany Coast	**Groundwater Area**	Albany	**Groundwater Province**	Bremer West
Surface Water Area	Albany Coast	**Surface Water SubArea**	Princess Royal Harbour	**GgStn Catchment Area(km2)**	N/A
Site Comment					

Depth Measurement Points (*Site reference: 60210118)*

Measurement Point Type	Elevation (m as per Datum Plane)	Datum	Measurement Method	Date	Comments
Ground level	2.49	AHD	Surveyed	16/03/1999	
Top of collar	2.49	AHD	Surveyed	16/03/1999	

Drilling - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: *26/05/2022*

Borehole Information (*Site reference: 60210118)*

Completed Date	12/01/1999	**Drill Method Name**	Auger		
Owner Name	Department of Water	**Drill Rig Name**	Unknown		
Drill Company Name	Water and Rivers Commission	**Total Construction Depth (mbGL)**	13.8	**Depth Drilled (mbGL)**	14.3
Comments	Comment: Headwork details: gatic Log event: Core samples retrieved in 0.8m length core barrel				

Casing (*Site reference: 60210118)*

From (mbGL)	To (mbGL)	Element	Material	Inlet Type	Inside Dia. (mm)	Outside Dia. (mm)	Aperture (mm)	Comments
0.000	12.800	Casing	PVC	Not applicable	20.000			
12.800	13.800	Inlet (screen)	Unknown	Slotted	20.000			

Fill (*Site reference: 60210118)*

From (mbGL)	To (mbGL)	Fill Type	Material Type	Fill Volume (m3)	Grain Size (mm)
0.000	1.400	Void Fill	Unknown		
12.400	13.800	Void Fill	Unknown		

Aquifers - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: 26/05/2022

Lithology Log *(Site reference: 60210118)*

From (mbGL)	To (mbGL)	Interpreted By	Substance	Lithological Description
0.000	0.800	Geologist--Internal staff	Sand	Silty sand, black-light grey (30)
0.800	1.600	Geologist--Internal staff	Sand	Sand, light grey, medium (35)
1.600	2.400	Geologist--Internal staff	Sand	Sand, light grey-rusty brown, medium (20); silty sand, rusty brown(40)
2.400	3.200	Geologist--Internal staff	Sand	Sand, rusty brown, coarse (35)
3.200	4.000	Geologist--Internal staff	Sand	Sand, brown, medium to coarse (70)
4.000	4.800	Geologist--Internal staff	Sand	Gravelly sand, brown, fine to very coarse (20); silty gravels, light grey-light blue (40)
4.800	5.600	Geologist--Internal staff	Sand	Sand, white-light grey, coarse to very coarse, minor angular, pebbles (60)
5.600	6.400	Geologist--Internal staff	Sand	Sand, white-light grey, coarse to very coarse, minor, angular, pebbles (70)
6.400	7.200	Geologist--Internal staff	Sand	Sand, white-light grey, coarse to very coarse, minor, angular, pebbles (50); sand, white-light grey, medium to very coarse, minor fines (30)
7.200	8.000	Geologist--Internal staff	Unknown	-
8.000	8.800	Geologist--Internal staff	Clay	Sandy clay, light grey-light brown, micaceous
8.800	9.600	Geologist--Internal staff	Clay	Sandy clay, ligh grey-light brown, micaceous (80)
9.600	10.400	Geologist--Internal staff	Clay	Sandy clay, light grey-light brown, micaceous (80)
10.400	11.200	Geologist--Internal staff	Unknown	-
11.200	12.000	Geologist--Internal staff	Clay	Clay, dark brown, minor silverish micas (70)
12.000	12.800	Geologist--Internal staff	Clay	Clay, dark brown, minor silvervish micas (80)
12.800	13.600	Geologist--Internal staff	Clay	Clay, dark brown, minor silverish micas (20); gravelly sand, dark brown, fine to very coarse (60)
13.600	14.400	Geologist--Internal staff	Sand	Sand, dark brown, medium to coarse, very hard (65)

Stratigraphy Log - No Data Available

Advanced Data Summary - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: 26/05/2022

Site reference 60210190 - Princess Royal Harbour - PRH 20 - PRH 20

Alternative Site References

Numbering System	Reference Code	Site Name	Short Name
AWRC	60210190	Princess Royal Harbour - PRH 20	PRH 20
WIN_ID	20055311		PRH 20
AQWAB	2427-1-NW-0206	602 - ALBANY COAST - PRH#20	PRH 20

General Details

Site Type	Groundwater	**Sub Type**	Bore or Well	**Site Geofeature**	Ground
Northing	6123686	**Easting**	578145	**Zone**	50
Latitude	-35.026473573	**Longitude**	117.856629561	**Spheroid**	GDA94
Thou250 Map Index	SI5011	**Geographic Precision (+/- m)**	+/-10m		
Local Govt Authority	CITY OF ALBANY	**Locality**	MOUNT ELPHINSTONE	**DWER Region**	South Coast
Catchment	Princess Royal Harbour	**Estuary**		**BOM Rainfall District**	9A - South Coast
River Basin	602 - Albany Coast	**Groundwater Area**	Albany	**Groundwater Province**	Bremer West
Surface Water Area	Albany Coast	**Surface Water SubArea**	Princess Royal Harbour	**GgStn Catchment Area (km2)**	N/A
Site Comment	Samples stored. Princess royal harbour nutrient project. Headworks: plastic gatic at ground level. Hole size: 4in. Piez diameter: 50mm. Field measurments - sample: 1192, ec: 403 us/cm, ph: 5.7, temp: 18.9 deg Celsius, eh: -133 mv, do 2.0 mg/L,. Swl recorded as 1.53m btoc. Total piezo depth recorded as 3.7m bgl, strata log recorded to 4m.				

Depth Measurement Points (*Site reference: 60210190)*

Measurement Point Type	Elevation (m as per Datum Plane)	Datum	Measurement Method	Date	Comments
Ground level	2.5	AHD	Geographic Information System	27/05/1997	

Drilling - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: *26/05/2022*

Borehole Information (*Site reference: 60210190)*

Completed Date	27/05/1997	**Drill Method Name**	Hollow stm aug		
Owner Name	Department of Water	**Drill Rig Name**	Unknown		
Drill Company Name	Water and Rivers Commission	**Total Construction Depth (mbGL)**	3.2	**Depth Drilled (mbGL)**	4
Comments					

Casing (*Site reference: 60210190)*

From (mbGL)	To (mbGL)	Element	Material	Inlet Type	Inside Dia. (mm)	Outside Dia. (mm)	Aperture (mm)	Comments
0.000	0.000	Unknown	Unknown	Not applicable				0 - 1.7m class 6 PVC casing
1.700	3.200	Inlet (screen)	Unknown	Slotted			0.400	Screen length 1.5m

Fill - No Data Available

Aquifers - No Data Available

Lithology Log *(Site reference: 60210190)*

From (mbGL)	To (mbGL)	Interpreted By	Substance	Lithological Description
0.000	0.200	Geologist--Internal staff	Soil	Top soil: dark brown top soil
0.200	1.100	Geologist--Internal staff	Sand	Clayey sand: dark brown clayey fine to medium sand with occaisional gravel
1.100	4.000	Geologist--Internal staff	Sand	Sand: dark brown to black fine to medium sand with occaisional clay

Stratigraphy Log - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: 26/05/2022

Advanced Data Summary (*Site reference: 60210190 WIN Site ID: 60210190)*

Readings by Project

Default Site Reference	Project Code	Project Name	First Measurement	Last Measurement	No of Measurements
60210190	SC-G-PRINCESSRYLHRBR	Princess Royal Harbour GW Invstgn for AQWABase	28/05/1997	17/10/1997	43
60210190	WA-G-1998AQWABDATA	1998 AQWABase Data Capture	27/05/1997	27/05/1997	3

Readings by Data Category

Default Site Reference	Data Category	First Measurement	Last Measurement	No of Measurements
60210190	Water levels - discrete	27/05/1997	27/05/1997	2
60210190	Water quality indicators - discrete	27/05/1997	27/05/1997	1
60210190	Water quality indicators - discrete	28/05/1997	17/10/1997	43

Readings By Variable Type

Default Site Reference	Variable Type	First Measurement	Last Measurement	No of Measurements
60210190	Inorganic metals	17/10/1997	17/10/1997	5
60210190	Inorganic non-metals	28/05/1997	17/10/1997	4
60210190	Measurement or observation of physical properties	28/05/1997	17/10/1997	12
60210190	Nutrients	28/05/1997	17/10/1997	22
60210190	Physical	27/05/1997	27/05/1997	1
60210190	Water level (discrete)	27/05/1997	27/05/1997	2

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: 26/05/2022

Site reference 60210191 - Princess Royal Harbour - PRH 21 - PRH 21

Alternative Site References

Numbering System	Reference Code	Site Name	Short Name
AWRC	60210191	Princess Royal Harbour - PRH 21	PRH 21
WIN_ID	20055312		PRH 21
AQWAB	2427-1-NW-0207	602 - ALBANY COAST - PRH#21	PRH 21

General Details

Site Type	Groundwater	**Sub Type**	Bore or Well	**Site Geofeature**	Ground
Northing	6123660	**Easting**	578167	**Zone**	50
Latitude	-35.026706297	**Longitude**	117.856873153	**Spheroid**	GDA94
Thou250 Map Index	SI5011	**Geographic Precision (+/- m)**	+/-10m		
Local Govt Authority	CITY OF ALBANY	**Locality**	MOUNT ELPHINSTONE	**DWER Region**	South Coast
Catchment	Princess Royal Harbour	**Estuary**		**BOM Rainfall District**	9A - South Coast
River Basin	602 - Albany Coast	**Groundwater Area**	Albany	**Groundwater Province**	Bremer West
Surface Water Area	Albany Coast	**Surface Water SubArea**	Princess Royal Harbour	**GgStn Catchment Area (km2)**	N/A
Site Comment	Samples stored. Princess royal harbour nutrient project. Headworks: plastic gatic at ground level. Hole size: 4in. Piez diameter: 50mm. Field measurments - sample: 1193, ec: 1582 us/cm, ph: 6.2, temp: 19.0 deg Celsius, eh: -219 mv, do 3.9 mg/L,. Swl recorded as 1.17m btoc.				

Depth Measurement Points (*Site reference: 60210191)*

Measurement Point Type	Elevation (m as per Datum Plane)	Datum	Measurement Method	Date	Comments
Ground level	2	AHD	Geographic Information System	27/05/1997	

Drilling - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: *26/05/2022*

Borehole Information (*Site reference: 60210191)*

Completed Date	27/05/1997	**Drill Method Name**	Hollow stm aug		
Owner Name	Department of Water	**Drill Rig Name**	Unknown		
Drill Company Name	Water and Rivers Commission	**Total Construction Depth (mbGL)**	3.5	**Depth Drilled (mbGL)**	4
Comments					

Casing (*Site reference: 60210191)*

From (mbGL)	To (mbGL)	Element	Material	Inlet Type	Inside Dia. (mm)	Outside Dia. (mm)	Aperture (mm)	Comments
0.000	0.000	Unknown	Unknown	Not applicable				0 - 2m class 6 PVC casing
2.000	3.500	Inlet (screen)	Unknown	Slotted			0.400	Screen length 1.5m

Fill - No Data Available

Aquifers - No Data Available

Lithology Log *(Site reference: 60210191)*

From (mbGL)	To (mbGL)	Interpreted By	Substance	Lithological Description
0.000	0.300	Geologist--Internal staff	Unknown	Roadbase: clayey gravel
0.300	1.300	Geologist--Internal staff	Sand	Sand: brown to dark brown fine to medium sand
1.300	4.000	Geologist--Internal staff	Sand	Clayey sand: brown clayey fine to medium sand with occaisional shells

Stratigraphy Log - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: 26/05/2022

Advanced Data Summary (*Site reference: 60210191 WIN Site ID: 60210191)*

Readings by Project

Default Site Reference	Project Code	Project Name	First Measurement	Last Measurement	No of Measurements
60210191	SC-G-PRINCESSRYLHRBR	Princess Royal Harbour GW Invstgn for AQWABase	28/05/1997	17/10/1997	38
60210191	WA-G-1998AQWABDATA	1998 AQWABase Data Capture	27/05/1997	27/05/1997	3

Readings by Data Category

Default Site Reference	Data Category	First Measurement	Last Measurement	No of Measurements
60210191	Water levels - discrete	27/05/1997	27/05/1997	2
60210191	Water quality indicators - discrete	27/05/1997	27/05/1997	1
60210191	Water quality indicators - discrete	28/05/1997	17/10/1997	38

Readings By Variable Type

Default Site Reference	Variable Type	First Measurement	Last Measurement	No of Measurements
60210191	Inorganic metals	17/10/1997	17/10/1997	5
60210191	Inorganic non-metals	28/05/1997	17/10/1997	4
60210191	Measurement or observation of physical properties	28/05/1997	17/10/1997	12
60210191	Nutrients	28/05/1997	17/10/1997	17
60210191	Physical	27/05/1997	27/05/1997	1
60210191	Water level (discrete)	27/05/1997	27/05/1997	2

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: 26/05/2022

Site reference 60210411 - Mount Elphinstone - C22 - C22

Alternative Site References

Numbering System	Reference Code	Site Name	Short Name
AWRC	60210411	Mount Elphinstone - C22	C22
WIN_ID	20055334		C22
AQWAB	2427-1-NW-0229	602 - ALBANY COAST BASIN - C22	C22

General Details

Site Type	Groundwater	**Sub Type**	Bore or Well	**Site Geofeature**	Ground
Northing	6124077	**Easting**	578214	**Zone**	50
Latitude	-35.022942801	**Longitude**	117.857349063	**Spheroid**	GDA94
Thou250 Map Index	SI5011	**Geographic Precision (+/- m)**	Unknown		
Local Govt Authority	CITY OF ALBANY	**Locality**	MOUNT ELPHINSTONE	**DWER Region**	South Coast
Catchment	Princess Royal Harbour	**Estuary**		**BOM Rainfall District**	9A - South Coast
River Basin	602 - Albany Coast	**Groundwater Area**	Albany	**Groundwater Province**	Bremer West
Surface Water Area	Albany Coast	**Surface Water SubArea**	Princess Royal Harbour	**GgStn Catchment Area (km2)**	N/A
Site Comment	Hazli a. Koomberi (hr 117, October 1998): unconfined aquifer in the quaternary sand and in the werillup formation sand and sandy clay; not suitable to take groundwater quality samples as the bore is slotted to above the surface and there is no cement block. Recovery: to 0.6m bswl in 30min. Filter pack material: 0 - 13.6m, 1 to 3.2mm graded gravel. Cordinates also recorded as: easting - 578090; northing - 6123940.				

Depth Measurement Points (*Site reference: 60210411)*

Measurement Point Type	Elevation (m as per Datum Plane)	Datum	Measurement Method	Date	Comments
Ground level	9.03	AHD	Geographic Information System	27/10/1990	
Top of casing	9.65	AHD	(none)	27/10/1990	

Drilling - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: *26/05/2022*

Borehole Information (*Site reference: 60210411)*

Completed Date	27/10/1990	**Drill Method Name**	Cable tool		
Owner Name	CSBP	**Drill Rig Name**	Unknown		
Drill Company Name	Western Irrigation Pty Ltd	**Total Construction Depth (mbGL)**	12.98	**Depth Drilled (mbGL)**	14
Comments	How pump tested: Pumped: mma for 1.7 hours				

Casing (*Site reference: 60210411)*

From (mbGL)	To (mbGL)	Element	Material	Inlet Type	Inside Dia. (mm)	Outside Dia. (mm)	Aperture (mm)	Comments
0.000	0.000	Unknown	Unknown	Not applicable	0.001			0.3m agl - 1.5m, 150mm diam. Id steel; 0.62m agl - 13.38m, 100mm diam. Class 9 PVC. Diameter modified from 0 to 0.001 to meet system key constraints. JAA 16-09-2016
0.000	12.980	Inlet (screen)	Unknown	Slotted				100mm diam. Class 9 PVC machine slotted 1.0%; originally slotted from 0.62m above surface

Fill - No Data Available

Aquifers - No Data Available

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: 26/05/2022

Lithology Log *(Site reference: 60210411)*

From (mbGL)	To (mbGL)	Interpreted By	Substance	Lithological Description
0.000	1.000	Non geologist--Consultant/Mining		Sand, black, fine to medium grained, moderately sorted, with some silt
1.000	2.000	Non geologist--Consultant/Mining		Sand, light brown, moderately rounded, well sorted
2.000	3.000	Non geologist--Consultant/Mining		Sand, dark brown, with some black silt
3.000	4.000	Non geologist--Consultant/Mining		Sand, silty, dark brown, fine grained, well rounded
4.000	7.000	Non geologist--Consultant/Mining		Sand, brown, moderately rounded
7.000	8.000	Non geologist--Consultant/Mining		Sand, brown, moderately rounded, 5% brown clay
8.000	9.000	Non geologist--Consultant/Mining		Sand, brown, fine to medium grained
9.000	10.500	Non geologist--Consultant/Mining		Sand, light brown, fine to medium grained, poorly sorted
10.500	14.000	Non geologist--Consultant/Mining		Clay, silty, brown, with some fine sand

Stratigraphy Log *(Site reference: 60210411)*

From (mbGL)	To (mbGL)	Interpreted By	Interpreted Date	Stratigraphy	Lithology1	Lithology2	Lithology3
0.000	10.800	Non geologist--Consultant/Mining	20/04/1999	? Quaternary	sand	(none)	(none)
10.800	14.000	Non geologist--Consultant/Mining	20/04/1999	? Werillup Fm	clay	silt, silty	sand

Government of Western Australia
Department of Water and Environmental Regulation

Site Details Report

Date: 26/05/2022

Advanced Data Summary (*Site reference: 60210411 WIN Site ID: 60210411)*

Readings by Project

Default Site Reference	Project Code	Project Name	First Measurement	Last Measurement	No of Measurements
60210411	SC-G-MNSTRHLLCTMNT	Munster Hill Catchment GW Invstgn for AQWABase	28/10/1990	28/10/1990	2
60210411	SC-G-MNSTRHLLCTMNT	Munster Hill Catchment GW Invstgn for AQWABase	28/10/1990	28/10/1990	6
60210411	SC-G-PRINCESSRYLHRBR	Princess Royal Harbour GW Invstgn for AQWABase	29/05/1997	17/10/1997	35

Readings by Data Category

Default Site Reference	Data Category	First Measurement	Last Measurement	No of Measurements
60210411	Water levels - discrete	28/10/1990	28/10/1990	2
60210411	Water quality indicators - discrete	28/10/1990	17/10/1997	41

Readings By Variable Type

Default Site Reference	Variable Type	First Measurement	Last Measurement	No of Measurements
60210411	Inorganic metals	17/10/1997	17/10/1997	5
60210411	Inorganic non-metals	29/05/1997	17/10/1997	3
60210411	Measurement or observation of physical properties	28/10/1990	17/10/1997	15
60210411	Nutrients	29/05/1997	17/10/1997	16
60210411	Organics	15/10/1997	15/10/1997	2
60210411	Water level (discrete)	28/10/1990	28/10/1990	2

Appendix D Dangerous Goods

AUSTRALIAN WOOL HANDLERS

Spearwood Wool Complex
Cnr Phoenix & Sudlow Roads
Spearwood
Western Australia
Tel (618) 9418 0300
Fax (618) 9418 6444

Postal Address
PO Box 1394 Bibra Lake
Western Australia 6965

Dept. of Mineral & Petroleum Resources
21 OCT 2002
A.M.
RECORDS OFFICE

18th October 2002

[redacted]
Department of Mineral & Petroleum Resources
100 Plain Street
East Perth WA 6004

Dear [redacted]

Re: Storage of Dangerous Goods – Overdue Licence Fees
Invoice / File No. S013122

I refer to your letters dated 17th September 2002 and 3rd October 2002 regarding the above and advise that we will not be renewing the overdue licence.

The Albany Woolstores are no longer in operation and the gas tank has been removed.

If you have any further queries, please call me on [redacted]

Regards

[redacted]

[redacted]

DKB.nrc/6012

Department of Mines, Industry Regulation and Safety
Released through an application under the FOI Act

S13122

Department of
Mineral and Petroleum Resources

Mineral House
100 Plain Street East Perth
Western Australia 6004
ABN 69 410 335 356

Telephone +618 9222 3333
Facsimile +618 9222 3430
www.mpr.wa.gov.au

Our ref: MR: S013122
Enquiries: [redacted]

Fax: 9222 3525

WOOLDUMPERS AUSTRALIA PTY LTD
PO BOX 283
LARA VIC 3212

Dear Sir/Madam

STORAGE OF DANGEROUS GOODS – OVERDUE LICENCE FEES

An audit check of our records has revealed that the licence to store dangerous goods issued in respect to the premises detailed below has expired.

INVOICE/ FILE NO.	LOCATION OF STORAGE	EXPIRY DATES	AMOUNT PAYABLE PER ANNUM
S 013122	1 SOUTH COAST RD ALBANY WA 6330	28/07/2002 to 2003 (1 year outstanding)	$29.00
		TOTAL DUE	$29.00

If the above premises is still being used for the storage of dangerous goods then the licence must be renewed and transferred into your name (application form to transfer the licence is enclosed).

Please forward to this office the amount owing or notification of the current status of the storage premises before **7 October 2002**. Payment methods available are explained on the attachment.

Alternatively, if storage has ceased, then your written confirmation that all storage facilities have been removed is required. If you have any queries, please telephone [redacted]

You are reminded that storage of dangerous goods on unlicensed premise constitutes a breach of the Explosives & Dangerous Goods (Dangerous Goods Handling and Storage) Regulations 1992 and it is therefore requested that this matter be given your urgent attention.

Yours sincerely

[redacted]

for DIRECTOR
EXPLOSIVES AND DANGEROUS GOODS
17 September 2002

[S:\[redacted]\Storage\Outstanding - Debt RecoveryWew OwnersWEW OWNER 1ST letter .doc]

Department of Mines, Industry Regulation and Safety
Released through an application under the FOI Act

Department of
Mineral and Petroleum Resources

File Note

REF:	S013122	**DATE:**	17 September 2002
SUBJECT:	**NEW OWNER ADDRESS**		

Contacted council new owner address is:

WOOLDUMPERS AUSTRALIA PTY LTD
PO BOX 283
LARA VIC 3212

[redacted]
EXPLOSIVES AND DANGEROUS GOODS

Department of Mines, Industry Regulation and Safety
Released through an application under the FOI Act

4

DEPARTMENT OF
MINERALS AND ENERGY
WESTERN AUSTRALIA

EXPLOSIVES AND DANGEROUS GOODS DIVISION
100 Plain Street, East Perth WA 6004
Tel - (08) 9222 3392 Fax - (08) 9222 3525
www.dme.wa.gov.au
ABN: 69 410 335 356

[redacted]
Chief Inspector

LICENCE TO STORE DANGEROUS GOODS

Issued in accordance with the Explosives and Dangerous Goods Act, 1961.

File Number S013122

Expiry Date 28/07/2002

Business Name ALBANY WOOLSTORES P/L
Address of Storage 1 SOUTH COAST ROAD
ALBANY WA 6330

Holder Name and Address AUSTRALIAN WOOL HANDLERS
1 SOUTH COAST ROAD
ALBANY WA 6330

Licence Fee $29.00

Storage Details Product Name	No. of Depots	Depot Type	Tank / Depot I.D.	UN No	Class	Sub Risk	Packing Group	Max. Storage (KL/TONNES)
LP GAS	1	GTD	19955	1075	2.1		I	3.80

Department of Mines, Industry Regulation and Safety
Released through an application under the FOI Act

This is your Validated Licence (Receipt details are shown below)

$28.00 being part of $28.00 received on 01/08/2001 Receipt No. 83481

Ref: DEXIS [redacted]2002260.16:37:32/001/S013122

S13122

Department of
Mineral and Petroleum Resources

Your ref:
Our ref: MR S013122
Enquiries: [redacted]
Email: [redacted]

Mineral House
100 Plain Street East Perth
Western Australia 6004
ABN 69 410 335 356

Telephone +618 9222 3333
Facsimile +618 9222 3430
www.mpr.wa.gov.au

AUSTRALIAN WOOL HANDLERS
1 SOUTH COAST ROAD
ALBANY WA 6330

RTS

Dear Sir/Madam

STORAGE OF DANGEROUS GOODS – OVERDUE LICENCE FEES

Your licence to store dangerous goods issued in respect to the premises detailed below has expired.

INVOICE/FILE NO.	LOCATION OF STORAGE	EXPIRY DATE	AMOUNT DUE
S013122	ALBANY WOOLSTORES P/L 1 SOUTH COAST ROAD ALBANY WA 6330	28/07/2002	$29.00

If the above premises is still being used for the storage of dangerous goods then the licence must be renewed.

Please forward to this office the amount owing before **30 September 2002**. Payment methods available are explained on the attachment.

Alternatively, if storage has ceased, then your written confirmation that all storage facilities have been removed is required. If you have any queries, please telephone [redacted].

You are reminded that storage of dangerous goods on unlicensed premise constitutes a breach of the Explosives & Dangerous Goods (Dangerous Goods Handling and Storage) Regulations 1992 and it is therefore requested that this matter be given your urgent attention.

Yours sincerely

[redacted]

for DIRECTOR
EXPLOSIVES AND DANGEROUS GOODS
2 September 2002

S:\[redacted]Storage\Outstanding - Debt Recovery\September 2002\1ST LETTER\os 1ST form letter 2 Sept 02.doc

Department of Mines, Industry Regulation and Safety
Released through an application under the FOI Act

Department of Mines, Industry Regulation and Safety
Released through an application under the FOI Act

IMPORTANT NOTICE

- **Licensees must ensure that a current licence is maintained as legal proceedings may commence as a consequence of operating without a valid licence.**
- **Any accident which occurs after the expiry date may nullify an insurance claim.**
- **A licensee shall notify the Chief Inspector of any proposed change in circumstances to licensed dangerous goods storage premises and shall notify the Chief Inspector if there is a new owner of occupier of licensed premises.**

- ***Please return your remittance to:***

  Department of Mineral and Petroleum Resources
  100 Plain Street
  EAST PERTH WA 6004

- ***Cheques and money orders are to be made payable to:***

  Department of Mineral and Petroleum Resources

- ***Credit card payments may be accepted by telephoning: 9222 3392***

  NB: Office hours only (between 8:30am – 4:30pm Monday to Friday)

.....

Complete this Section if paying by credit card and post to Dept of Mineral & Petroleum Resources, 100 Plain Street, East Perth WA 6004

INVOICE / FILE NUMBER	**S013122**

Card number ☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐☐

Please tick:

☐ Bank Card ☐ Master Card ☐ Visa Card

Card Holder Name (Please Print): _____

Expiry Date: _____

Amount : $_____

Signature: _____

S:\[redacted]\Storage\Outstanding - Debt Recovery\September 2002\1ST LETTER\os 1ST form letter 2 Sept 02.doc

Department of Mines, Industry Regulation and Safety
Released through an application under the FOI Act

PJ:EEB A13122
[redacted]

Albany Woolstores P/L
1 South Coast Road
ALBANY WA 6330

Attention: [redacted]

Dear Sir

DANGEROUS GOODS REGULATIONS 1992
PREMISES: 1 SOUTH COAST ROAD, ALBANY
PROPOSAL: 1X 3.8 KL LP GAS TANK

Thank you for your submission dated 11 October 1995. The assessment has now been completed and the licence will be amended subject to the following conditions.

1. It is required that no fixed ignition source be located within the hazardous zone surrounding the tank, i.e. 1m vertically and 4.6m laterally from the tank shell as defined in Australian Standard 2430.3-1991.

2. Vegetation which might become a fire hazard shall be kept short in the vicinity of the LP Gas tank.

3. No ignition source shall be located within the hazardous zone of a decanting cylinder as defined by Figure G4 of Australian Standard 1596-1989 (copy enclosed).

General Requirements

1. Placarding is required in accordance with the Worksafe Guidance Note "Storage of Chemicals". Please review and ensure compliance with the relevant requirements of the attached Divisional Guidance Note S302

2. An Emergency Plan is required in accordance with Regulation 4.28 of the above mentioned Regulations. Please review and ensure compliance with the relevant requirements of the attached Divisional Guidance Note S310.

Full compliance with Australian Standard 1596-1989 is required for the storage and handling of LP Gas.

If you have any queries, please do not hesitate to contact this Division.

Yours faithfully

[redacted]

FOR CHIEF INSPECTOR
EXPLOSIVES AND DANGEROUS GOODS DIVISION

16 October, 1995
Encl.

Department of Mines, Industry Regulation and Safety
Released through an application under the FOI Act

ALBANY WOOLSTORES PTY LTD

ACN 008 674 253

1 South Coast Road
PO Box 475
Albany W A 6330

Telephone (098) 41 2177
Facsimile (098) 42 1024

EXPLOSIVES DIVISION
13 OCT 1995
RECEIVED

11th October 1995

Mr [redacted]
Department of Minerals and Energy
Explosives and Dangerous Goods Division
Mineral House
100 Plain Street
East Perth WA 6004.

Dear [redacted]

In reply to your letter dated 6th September 1995, the following alterations to our gas tank will take place in the next couple of weeks.

(1) When the tank is down to 10% off capacity, Kleenheat Gas will move the tank to a distance of not less than 7.2m from the store and old work shop.

(2) A barrier will be erected 3 metres from the nozzle for refilling.

(3) 3 Fire fighting hydrants are available in case of fire (Fire Brigade use only).

(4) Length of hose for filling gas bottles is 7 metres.

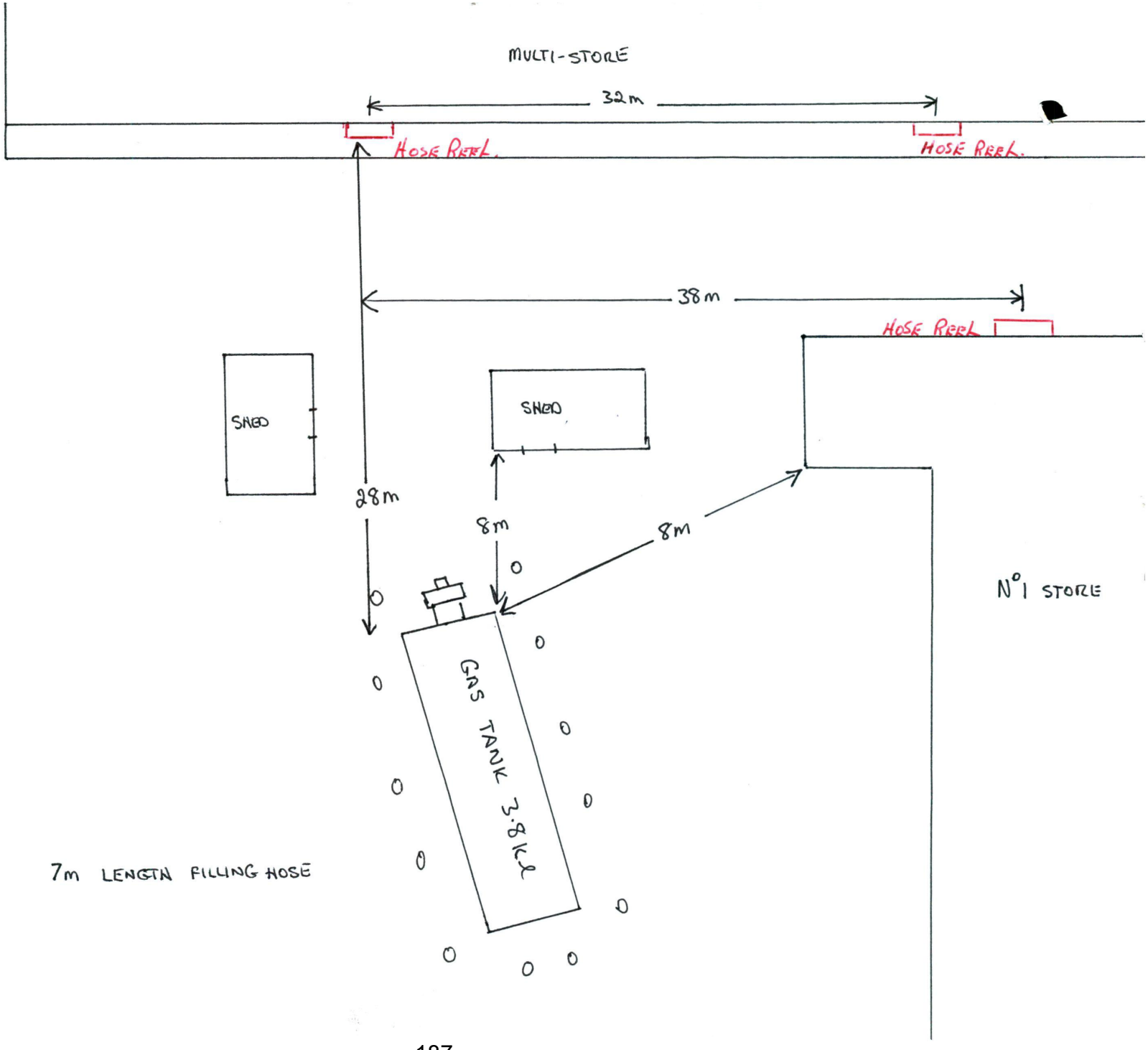
A plan is enclosed for your information on the relevent requirements to be addressed as above.

Yours faithfully

[redacted]

Department of Mines, Industry Regulation and Safety
Released through an application under the FOI Act

8



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9

TRANSMISSION REPORT

****

:MINES DEPT HUMAN RES (06 OCT '95 09:24)

DATE	START TIME	REMOTE TERMINAL IDENTIFICATION	MODE	TIME	RESULTS	TOTAL PAGES	DEPT. CODE	FILE NO.
06 OCT	09:22	098 421024	G3ST	01'03"	OK	02		

[redacted] informed me the tank is being moved when it's nearly empty and he will notify us in the next few weeks [redacted] 6/10/95

BY [redacted] 16/11/95

Department of Mines, Industry Regulation and Safety
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DEPARTMENT OF MINERALS AND ENERGY, WESTERN AUSTRALIA

EXPLOSIVES AND DANGEROUS GOODS DIVISION

100 Plain Street, East Perth WA 6004 Tel - (09) 222 3333 Fax - (09) 222 3525

FAX TRANSMISSION

TO:	[redacted]		
COMPANY NAME:	Albany Woolstores		
FROM:	[redacted]		
DATE:	6 October 1995		
FILE REFERENCE:	A13122	TOTAL NUMBER OF PAGES:	2

Attached is the copy of the letter as promised.

Regards

[redacted]

Department of Mines, Industry Regulation and Safety
Released through an application under the FOI Act

✉✉ IF TRANSMISSION IS FAULTY, PLEASE PHONE (09) 222-3379 ✉✉

Department of Mines, Industry Regulation and Safety
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DEPARTMENT OF
MINERALS AND ENERGY
WESTERN AUSTRALIA

EXPLOSIVES AND
DANGEROUS GOODS
DIVISION

MINERAL HOUSE
100 PLAIN STREET (CNR ADELAIDE TCE)
EAST PERTH
WESTERN AUSTRALIA 6004

TELEPHONE (09) 222 3333
FACSIMILE (09) 222 3525

Your Ref :
Our Ref : PJ:EEB A13122
Enquries to : [redacted]
Telephone :

Albany Woolstores Pty Ltd
1 South Coast Rd
ALBANY WA 6330

Attention: [redacted]

Dear Sir

DANGEROUS GOODS REGULATIONS 1992
PREMISES: 1 SOUTH COAST RD, ALBANY WA 6330
PROPOSAL: 1X 3.8 KL LP GAS TANK
DRAWING NOS: DOM 139

Further to your application dated 21 December 1992 you were issued a provisional licence pending a full assessment. The assessment is now being pursued and I advise that the licence cannot be amended until written advice on how the following items are to be addressed is forwarded to this office.

1. Please provide the length of the hose for filling forks lift tanks.

2. The separation distance from the tank to the "store" and the "old shops" as marked on plan.

3. Under Australian Standard 1596-1988 the required separation distance from the tank to the workshop is 7.2m. The plan indicates that it is 5m. A proposal to remedy this non-compliance is required. If the wall of the workshop is a 4 hour rated fire wall the separation distance may be measured to the nearest opening in the wall (door, window, vent), if this is the case please submit a plan showing this.

4. Indicate provisions made to prevent connection of a nozzle to a vehicle within 3 metres of the tank.

5. Indicate any fire fighting equipment you may have.

If you have any queries, please do not hesitate to contact this Division.

Yours faithfully

[redacted]
FOR CHIEF INSPECTOR
EXPLOSIVES AND DANGEROUS GOODS DIVISION
6 September 1995

[redacted] DOC

PJ:EEB A13122

[redacted]

Albany Woolstores Pty Ltd
1 South Coast Rd
ALBANY WA 6330

Attention: [redacted]

Dear Sir

DANGEROUS GOODS REGULATIONS 1992
PREMISES: 1 SOUTH COAST RD, ALBANY WA 6330
PROPOSAL: 1X 3.8 KL LP GAS TANK
DRAWING NOS: DOM 139

Further to your application dated 21 December 1992 you were issued a provisional licence pending a full assessment. The assessment has now been completed and the licence will be renewed subject to the following items being suitably addressed.

1. The length of the hose for filling forks lift tanks.

2. The separation distance from the tank to the "store" and the "old shops" as marked on plan.

3. Under Australian Standard 1596-1988 the required separation distance from the tank to the workshop is 7.2m. The plan indicates that it is 5m. A proposal to remedy this non-compliance is required. If the wall of the workshop is a 4 hour rated fire wall the separation distance may be measured to the nearest opening in the wall (door, window, vent), if this is the case please submit a plan showing this.

4. Indicate provisions made to prevent connection of a nozzle to a vehicle within 3 metres of the tank.

5. Indicate any fire fighting equipment you may have.

If you have any queries, please do not hesitate to contact this Division.

Yours faithfully

[redacted]

FOR CHIEF INSPECTOR
EXPLOSIVES AND DANGEROUS GOODS DIVISION
6 September 1995

[redacted].DOC

Department of Mines, Industry Regulation and Safety
Released through an application under the FOI Act

STORAGE OF DANGEROUS GOODS ASSESSMENT FORM

HOLDER DETAILS: ALBANY WOOLSTORES **FILE NO:** A13122
PREMISES DETAILS: 1 South Coast Rd Albany

098 412 177

PREMISES CODE: **PLAN NO:**
DEXIS CHECK OF PREMISES: Y/N **DEXIS UPDATED: Y/N**
FILE TRACKING: Y/N

1.0 PROPOSED STORAGE:

Depot type	Correct technical name of goods	UN No.	Class, subrisk	Pckg group	Amount	Factor	Storage Factor
GTD	LPGAS	1075	2.1	-	3.8KL	2	7600

2.0 SEPARATION DISTANCES

LIQUID WITHDRAWAL. Forklifts

SEPARATION TO:	REG (m)	ACTUAL (m)	STATUS
(i) Protected Works	1596		
- Workshop	7.2m	8m ≥ 5m	✓
- STORE		8m ?	✓
- OLD SHOPS.		8m ?	✓
hose reach to STORE.		?	
OLD SHOP.		?	
(ii) Boundary / Public Places			
	4.6	28	✓
(iii) Ignition sources			
	4.6m		conditional
(iv) Other dangerous goods			
hose reach zone.		5m beyond	✓

Department of Mines, Industry Regulation and Safety
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3.0 BUILDING Status N/A

Capacity: _____

Liquid Tight: _____

Clearance Distance: _____

4.0 VENTILATION Status ✓

Open Air.

5.0 FIRE PROTECTION Status ✓

Requires hose reel or fire Extinguisher.

Hose Reel Here.

6.0 PLACARDING/NOTICES: Status •

7.0 EMERGENCY PLAN: _____ Status •

MANIFESTS : _____ Status _____

8.0 BULK CONTAINER : CONST. STD _____ Status _____

9.0 OTHER has crash protection around private compound. Dispenser is protected.

10.0 SUMMARY 1.0 COMPLIES 2.0 DOES NOT COMPLY 3.0 MORE INFO REQ'D

REFER TO LETTER / FAX DATED: _____

INSPECTOR: _____ DATE: _____

Department of Mines, Industry Regulation and Safety
Released through an application under the FOI Act

14

[redacted]

DANEX UPDATED WITH

STORAGE AND HOLDER DETAILS

[redacted]

[redacted]09.09.93 PLEASE ISSUE AUTOMATIC LICENCE

LETTER /

[redacted]

[redacted]

30/8/93

Department of Mines, Industry Regulation and Safety
Released through an application under the FOI Act

[redacted]

Your Ref: 13122
Our Ref: Duty Inspector
Enquiries to: [redacted]
Telephone:

DEPARTMENT OF
MINERALS AND ENERGY
WESTERN AUSTRALIA

EXPLOSIVES AND
DANGEROUS GOODS
DIVISION

MINERAL HOUSE
100 PLAIN STREET (CNR ADELAIDE TCE)
EAST PERTH
WESTERN AUSTRALIA 6004

TELEPHONE (09) 222 3333
FACSIMILE (09) 222 3525

Shire Clerk
Shire of Albany
PO Box 809
ALBANY WA 6330

Dear Sir,

DANGEROUS GOODS REGULATIONS, 1992

An application for a licence to store dangerous goods has been received by this Division (copy enclosed).

This Division is considering the application and if all the requirements of the above regulations in respect to public safety and protection of property are met a licence will be issued.

This advice is forwarded to enable Council to consider the implications of the proposal in respect to your by-laws if necessary.

Yours faithfully

[redacted]

CHIEF INSPECTOR
02·09·93

Department of Mines, Industry Regulation and Safety
Released through an application under the FOI Act

DEPARTMENT OF MINERALS AND ENERGY WESTERN AUSTRALIA

EXPLOSIVES AND DANGEROUS GOODS ACT 1961 - DANGEROUS GOODS REGULATIONS 1992

APPLICATION FOR LICENCE TO STORE DANGEROUS GOODS

READ THIS FIRST

1. YOU CAN AVOID UNNECESSARY DELAYS IN THE ASSESSMENT OF THIS APPLICATION BY READING GUIDANCE NOTE S301 (STORAGE OF DANGEROUS GOODS - LICENSING AND EXEMPTIONS) FIRST AND CHECKING THAT ALL OF THE FOLLOWING MATTERS HAVE BEEN SUITABLY ADDRESSED:

   - All information as requested in parts A and B of this application
   - Provision of a ground plan showing the proposed location of all storage facilities, dispensers and handling areas and the separation distances to buildings, boundaries and protected works
   - Provision of a scaled plan showing the position of the premises in relation to roads, railways, buildings and protected works within 50 metres of the boundaries of the premises (this and the above requirement may be satisfied by one drawing)
   - Provision of other information necessary to determine whether the proposal will comply with the regulations. Such information will depend on the complexity of the proposal and may include detailed engineering design drawings, tank installation details, fire protection, emergency response plans, quantitative risk assessment, segregation proposals, bund design and system controls.

2. THIS APPLICATION DOES NOT CONSTITUTE AN APPLICATION FOR BUILDING APPROVAL AND ANY LICENCE ISSUED IN RESPECT OF THIS APPLICATION IS NOT A BUILDING APPROVAL FOR THE PURPOSES OF COMPLYING WITH LOCAL AUTHORITY BY-LAWS OR ANY OTHER APPLICABLE BUILDING REGULATIONS.

3. APPLICATIONS FOR LICENCE ARE TO BE MADE TO :

   CHIEF INSPECTOR
   DEPARTMENT OF MINERALS AND ENERGY
   EXPLOSIVES AND DANGEROUS GOODS DIVISION
   100 Plain Street
   EAST PERTH WA 6004
   Phone (09)222 3333 Fax (09) 222 3525

PART A - APPLICANT AND PREMISES DETAILS

1. INTENDED LICENSEE

NAME: ALBANY WOOLSTORES PTY LTD

ADDRESS: 1 SOUTH COAST RD ALBANY WA

POSTCODE: 6330

2. PREMISES TO BE LICENSED

BUSINESS TRADING NAME: ALBANY WOOLSTORES PTY LTD

ADDRESS: | | LOT No. | 1 | STREET No. | SOUTH COAST RD

TOWN: ALBANY POSTCODE: 6330

NATURE OF BUSINESS: WOOL HANDLING CENTRE

PURPOSE OF STORAGE: STORAGE FACILITY - GAS FORK TRUCKS

IF PREMISES IS CURRENTLY LICENSED, WHAT IS THE LICENCE FILE NUMBER ?

SHIRE / LOCAL AUTHORITY: TOWN OF ALBANY

3. APPLICANT DETAILS

NAME: [redacted] PHONE: [redacted]

SIGNATURE: [redacted] DATE: 21/12/92.

POSITION (eg Manager, Secretary): [redacted]

OFFICE USE ONLY

EXPLOSIVES DIVISION
8 JUN 93
RECEIVED

CLERK

DATE

MSB/

ATTN

FROM

DATE 5/8/93

ACTION BY [redacted]

DISCUSS

REVIEW

DRAFT REPLY

REPLY

555/sys1

Department of Mines, Industry Regulation and Safety
Released through an application under the FOI Act

PART B - DETAILS OF PROPOSED STORAGE

DEPOT TYPE	TANK IDENTIFICATION NUMBER	CORRECT TECHNICAL NAME OF GOODS	UN No.	CLASS	SUB-RISK	PACKAGING GROUP	AMOUNT (kilolitres/tonnes)
STD	19955	LPG STORAGE	1075	2.1			3.8 KL

Department of Mines, Industry Regulation and Safety
Released through an application under the FOI Act

NOTES:

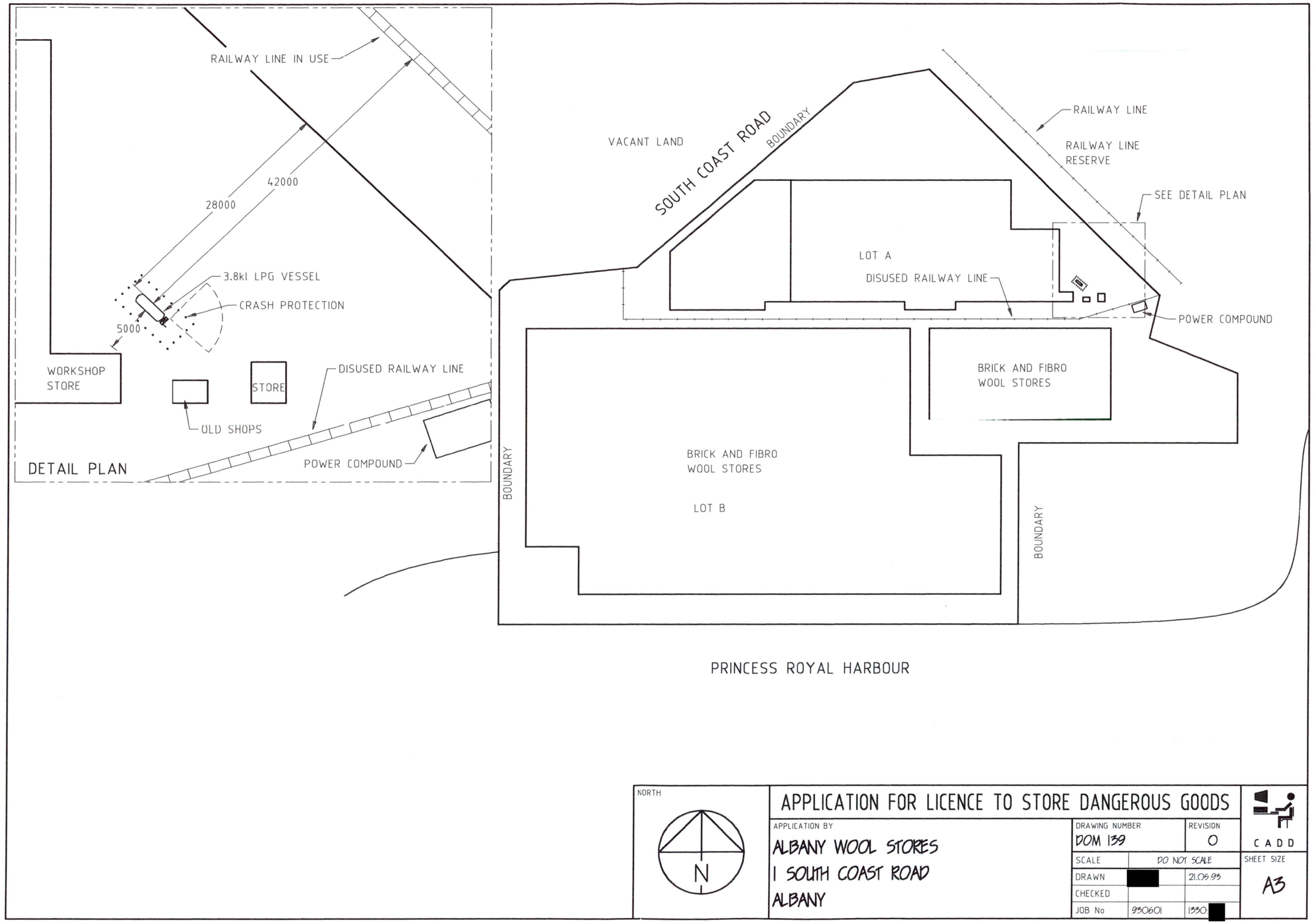
1. An identification or serial number must be specified for each bulk container / tank and this number must be clearly marked on the external surface of the container. It is recommended that the identification number also be marked on the roof of each tank. For underground tanks the identification number may be embossed on the tank dipstick and should correspond with the manufacturers serial number.

2. Each individual bulk container and depot must be listed separately above and its location shown on an attached plan of the premises. All dangerous goods intended or likely to be stored on the premises must be specified.

3. For package depots containing numerous types of dangerous goods it is sufficient to group the goods according to class and packaging group provided that any non-compatible goods are listed separately.

4. Technical information such as UN No., Packaging Group etc. may be sourced from the manufacturer / supplier, package labels, material safety data sheets or the ADG Code. Guidance Note S301 lists the necessary information for many of the commonly encountered dangerous goods.

Department of Mines, Industry Regulation and Safety
Released through an application under the FOI Act



Appendix E Basic Summary of Records

Government of Western Australia
Department of Water and Environmental Regulation

Our ref: DMO 10921
Enquiries: Registrar
Phone: 1300 762 982
Fax: (08) 6364 7001
Email: info@dwer.wa.gov.au

Logan Penman
JBS&G
1/50 Subiaco Square Rd
Subiaco WA 6008

Dear Sir/Madam

BASIC SUMMARY OF RECORDS REQUEST

Thank you for your Basic Summary of Records request for the site consisting of the following parcel(s) of land:

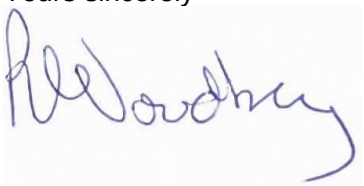
- LOT 52 ON PLAN 3571 as shown on certificate of title 1123/15 known as 22 Woolstores Pl, Mount Elphinstone WA 6330
- LOT 53 ON PLAN 3571 as shown on certificate of title 1123/16 known as 18 Woolstores Pl, Mount Elphinstone WA 6330
- LOT 54 ON PLAN 3571 as shown on certificate of title 1433/470 known as 10 Woolstores Pl, Mount Elphinstone WA 6330
- LOT 55 ON PLAN 3571 as shown on certificate of title 1246/459 known as 53 Frenchman Bay Rd, Mount Elphinstone WA 6330

which Department of Water and Environmental Regulation (the department) received on 21/07/2022.

A search of the department's records of known and suspected contaminated sites was undertaken however, our records indicate that as of 26/07/2022 this site has not been reported to the department as a known or suspected contaminated site either prior to or after the commencement of the *Contaminated Sites Act 2003*.

For general enquiries, please contact the Registrar on 1300 762 982.

Yours sincerely



Penny Woodberry, Manager

CONTAMINATED SITES REGULATION
Delegated Officer under section 91
of the *Contaminated Sites Act 2003*

26/07/2022
Enc. Receipt Number RR029091

Government of **Western Australia**
Department of **Water and Environmental Regulation**

Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report generated at 03:44:30PM, 02/08/2022

Receipt No:

ID No: *39171*

Search Results

This response relates to a search request received for:

76 Grey St
Mount Melville, WA, 6330

This parcel belongs to a site that contains 5 parcel(s).

According to Department of Water and Environmental Regulation records, this land has been reported as a known or suspected contaminated site.

Address	76 Grey St Mount Melville, WA, 6330
Lot on Plan Address	Lot 76 On Plan 26132
Parcel Status	**Classification:** 29/10/2018 - *Remediated for restricted use* **Nature and Extent of Contamination:** Groundwater beneath the site has been impacted by landfill leachate and contains elevated levels of metals, nutrients and acidity. **Restrictions on Use:** Groundwater quality has been impacted by landfill leachate and should not be abstracted for any purpose without prior testing to ensure it is suitable for it proposed use. The land use of the site is restricted to recreational open space, which excludes sensitive uses with accessible soil such as childcare centres, kindergartens, pre-schools and primary schools. The site should not be developed for a more sensitive use such as residential use or childcare centres without further contamination assessment and/or remediation. **Reason for Classification:** This site was reported to the Department of Water and Environmental Regulation (DWER) as per reporting obligations under section 11 of the 'Contaminated Sites Act 2003' (the Act), which commenced on 1 December 2006. The site was first classified under section 13 of the Act based on information submitted to DWER by July 2011. The site has been classified again under section 13 of the Act to reflect additional technical information submitted to DWER by October 2018. This site, known as 'Area C', formed a portion of a larger land-holding occupied by the Albany fertiliser works. A preliminary site investigation was undertaken in 2004 which found that the site had not historically been used for any purpose related to the fertiliser works. However, the south-western portion of the site was used as a bulk fuel depot for approximately 18 years between 1956 and 1974. This is a potentially contaminating activity as specified in the guideline 'Assessment and management

Disclaimer
This Summary of Records has been prepared by Department of Water and Environmental Regulation (DWER) as a requirement of the Contaminated Sites Act 2003. DWER makes every effort to ensure the accuracy, currency and reliability of this information at the time it was prepared, however advises that due to the ability of contamination to potentially change in nature and extent over time, circumstances may have changed since the information was originally provided. Users must exercise their own skill and care when interpreting the information contained within this Summary of Records and, where applicable, obtain independent professional advice appropriate to their circumstances. In no event will DWER, its agents or employees be held responsible for any loss or damage arising from any use of or reliance on this information. Additionally, the Summary of Records must not be reproduced or supplied to third parties except in full and unabridged form.

Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report generated at 03:44:30PM, 02/08/2022

of contaminated sites' (Department of Environment Regulation [DER], 2014). The site is understood to have remained vacant since the fuel depot was abandoned in 1974.

The site was reported in 2011 on the basis of results from the sampling of groundwater monitoring wells installed on the site which found low pH and elevated metals and nutrients.

A limited soil and groundwater investigation was undertaken between 2005 and 2007 to assess the potential for contamination associated with the historical use of the site for fuel storage. These investigations did not identify contamination associated with fuel storage, such as from petroleum hydrocarbons, in soil or groundwater in the vicinity of the abandoned above-ground storage tanks (ASTs). However, it is not clear that the soil investigations appropriately targeted areas of potential contamination associated with the historical fuel depot.

Further soil investigations were undertaken in 2017 specifically targeting soils in the vicinity of the abandoned ASTs and other buildings associated with the former use of the site as a fuel depot. Petroleum hydrocarbon impacts were not identified, however, an area of lead-impacted soils were identified adjacent to the opening of an unknown concrete building. The source of the lead was not known, but was suspected to be associated with runoff from surfaces of the building potentially coated with lead-based paint. The concentration of lead identified in shallow soils exceeded Health Investigation Levels for recreational land and Ecological Investigation Levels for urban residential land and public open space as published in the 'National Environment Protection (Assessment of Site Contamination) Measure 1999' (the NEPM). These are relevant criteria given that the site is proposed to be developed for public recreation purposes including a mountain bike park and centre for youth and culture events.

A systematic inspection undertaken in 2017 did not identify any evidence of contamination at the site such as from the unauthorised disposal of solid wastes.

Remedial works were undertaken during 2018 comprising the excavation and off-site disposal of approximately half a cubic metre of lead-contaminated soils. Remedial works were undertaken in successive phases based on the analysis of validation samples. Final validation sampling and analysis demonstrated that lead-impacted soils exceeding relevant health-based and ecological based screening criteria had been successfully remediated.

Following remediation, no soil contamination has been identified that would pose a potential risk to human health under the proposed recreational landuse. However, it is noted that soil investigations completed at the site were limited by the presence of residual infrastructure, such as the seven concrete ASTs, and by the absence of specific historical information regarding the use of the site as a fuel depot, such as the location of pipework or pumps.

Periodic groundwater monitoring has been undertaken at the site and across the broader catchment area which includes a former fertiliser manufacturing facility to the west and an operating municipal landfill to the north. These investigations have found that groundwater to the north and west of this site has been impacted by landfill leachate associated with the municipal landfill located at 37 Maxwell Street, Mount Melville. Waste disposal has been undertaken since the 1970s into an unlined cell and is anticipated to continue until approximately 2026. Landfilling and waste disposal is a potentially contaminating activity as specified in the guideline 'Assessment and management of contaminated sites' (DER, 2014). The landfill site has been classified separately under the Act.

Groundwater monitoring undertaken at this site has found that that chloride and metals (such as iron and aluminium) are present in groundwater beneath the site at concentrations exceeding assessment

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Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report generated at 03:44:30PM, 02/08/2022

levels for non-potable use of groundwater specified in the 'Assessment and management of contaminated sites' (DER, 2014). However, the criteria for the substances identified are based on aesthetic considerations, such as taste or impact upon pipework through corrosion or scale formation. No potential contaminants were identified in groundwater at concentrations that would pose a potential risk to human health.

Nutrients, acidity and metals (such as iron, copper and zinc) were also identified in groundwater at levels exceeding assessment levels for marine waters (DER, 2014). These criteria are relevant given the site is within 500 metres of Princess Royal Harbour. However, a review of groundwater data from across the catchment area indicates that the levels of nutrients, acidity and metals in groundwater beneath this site are indicative of background up-hydraulic gradient groundwater quality. The groundwater data suggests that regional groundwater quality has been impacted by off-site up gradient sources, such as the municipal landfill to the north, which has been classified separately under the Act and at the time of classification is subject to ongoing investigations.

Based on the information provided, the site appears suitable for proposed public open space and recreational land use, but may not be suitable for more sensitive land uses (e.g. residential housing or child care centres).

The site has been remediated such that it is suitable for the proposed public open space and recreational land use, but may not be suitable for a more sensitive land use. Therefore, the site is classified as 'remediated for restricted use'.

A memorial stating the site's classification has been placed on the certificate of title, and will trigger the need for further investigations and risk assessment should the site be proposed for a more sensitive land use.

DWER, in consultation with the Department of Health, has classified this site based on the information available to DWER at the time of classification. It is acknowledged that the contamination status of the site may have changed since the information was collated and/or submitted to DWER, and as such, the usefulness of this information may be limited.

Other Relevant Information:

Additional information included herein is relevant to the contamination status of the site and includes DWER's expectations for action that should be taken to address potential or actual contamination described in the Reasons for Classification.

Where the land is part of a transaction - sale, mortgagee or lease agreement, the land owners MUST PROVIDE WRITTEN DISCLOSURE (on the prescribed Form 6) of the site's status to any potential owner, mortgagee (e.g financial institutions) or lessee at least 14 days before the completion of the transaction. A copy of the disclosure must also be forwarded to DWER.

Based on the available information, groundwater contamination on this site appears to have originated from nearby land at 37 Maxwell Street, Mount Meville, which has been classified separately under the Act. Therefore this site appears to be consistent with the definition of an "affected site" as specified in Part 1, Section 3 of the Act. Under the Act, the person responsible for the remediation of a source site is also responsible for remediation of any resulting contamination at related affected sites.

Action Required:

Disclaimer
This Summary of Records has been prepared by Department of Water and Environmental Regulation (DWER) as a requirement of the Contaminated Sites Act 2003. DWER makes every effort to ensure the accuracy, currency and reliability of this information at the time it was prepared, however advises that due to the ability of contamination to potentially change in nature and extent over time, circumstances may have changed since the information was originally provided. Users must exercise their own skill and care when interpreting the information contained within this Summary of Records and, where applicable, obtain independent professional advice appropriate to their circumstances. In no event will DWER, its agents or employees be held responsible for any loss or damage arising from any use of or reliance on this information. Additionally, the Summary of Records must not be reproduced or supplied to third parties except in full and unabridged form.

Government of **Western Australia**
Department of **Water and Environmental Regulation**

Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report generated at 03:44:30PM, 02/08/2022

	As the soil investigations at the site were limited by the presence of residual fuel depot infrastructure, such as the large concrete storage tanks, DWER recommends that further assessment be undertaken in the future if these structures are proposed to be removed.
Certificate of Title Memorial	Under the Contaminated Sites Act 2003, this site has been classified as "remediated for restricted use". For further information on the contamination status of this site, please contact Contaminated Sites at the Department of Water and Environmental Regulation.
Current Regulatory Notice Issued	**Type of Regulatory Notice:** *Nil* **Date Issued:** *Nil*
General	No other information relating to this parcel.

Disclaimer
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Government of Western Australia
Department of Water and Environmental Regulation

Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report generated at 03:48:19PM, 02/08/2022

Receipt No:

ID No: *72938*

Search Results

This response relates to a search request received for:

198 Hanrahan Rd
Mount Elphinstone, WA, 6330

This parcel belongs to a site that contains 1 parcel(s).

According to Department of Water and Environmental Regulation records, this land has been reported as a known or suspected contaminated site.

Address	198 Hanrahan Rd Mount Elphinstone, WA, 6330
Lot on Plan Address	Lot 201 On Plan 76615
Parcel Status	**Classification:** 26/02/2021 - *Remediated for restricted use* **Nature and Extent of Contamination:** Lead is present in soil at the sulfur pad, within the footprint of the former acid plant, and at the lime solids ponds at variable depths between 0.5 and 3 metres below ground level. Buried wastes, potentially including asbestos-containing material, are present beneath the sulfur pad area. Stockpiles of 'lime solids' waste remain at the western edge of the sulfur pad. Groundwater quality varies across the site, with groundwater in some locations having elevated levels of acidity, fluoride and metals. Nutrients, such as phosphorus and ammonia, are present in groundwater beneath the site and in surface water within the site's drainage network. Nutrients are also present in Munster Hill Drain located along the site's western boundary. **Restrictions on Use:** The land use of the site is restricted to the existing licensed commercial/industrial land use, which excludes sensitive uses with accessible soil such as childcare centres, kindergartens, pre-schools and primary schools. The site should not be developed for a more sensitive use such as residential use, childcare centres or recreational open space, without further contamination assessment and/or remediation. Due to the nature and extent of groundwater contamination, the abstraction and use of groundwater for any purpose is not recommended. **Reason for Classification:** This site, known as 'Area D north', forms a portion of a larger landholding occupied by the Albany

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fertiliser works, and was reported to the Department of Water and Environmental Regulation (the department) as per reporting obligations under section 11 of the 'Contaminated Sites Act 2003' (the Act), which commenced on 1 December 2006.

The site was first classified under section 13 of the Act based on information submitted to the Department by May 2007. The site has been classified again under section 13 of the Act to reflect additional technical information submitted to the department by November 2020.

A superphosphate fertiliser plant historically operated on the site for approximately 47 years, from 1954 to 2001. The site has also been used for fuel and chemical storage and fertiliser dispatch for approximately 67 years, since 1954. Historically, solid and liquid wastes were disposed on-site. Fertiliser production, fuel and chemical storage and landfilling are land uses which have the potential to cause contamination, as specified in the guideline 'Assessment and management of contaminated sites' (Department of Environment Regulation [DER], 2014).

A preliminary site investigation (PSI) was carried out at the site in May 2004 which identified a number of potential sources of soil and groundwater contamination associated with historical and current site infrastructure and/or activities.

A limited soil investigation was undertaken in 2004 north of 'superphosphate bin' in an area known as the former 'sulfur pad'. The PSI had found that this area was historically used for the storage of raw materials and wastes associated with fertiliser manufacturing. Test pitting identified the presence of buried wastes (such as wood, metal and wire). Soil sampling identified elevated levels of acidity and sulfate. Lead was found at concentrations exceeding ecological and health-based screening criteria applicable at the time of the investigation. These soil impacts were believed to be associated with the historical disposal of lead sulphate wastes.

Further detailed soil investigations were undertaken in the former 'sulfur pad' area during 2013. Various metals (such as cadmium, copper, lead and zinc) phosphorus and sulfate were found at concentrations exceeding Ecological Investigations Levels as specified in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment and Conservation [DEC], 2010). Lead was also identified in three locations at concentrations exceeding Health Investigation Levels for commercial industrial land use, as specified in DEC, 2010. These were relevant criteria at the time the investigations were undertaken.

A small fragment of asbestos-containing material (ACM) was identified in one location entrained within buried wastes. Based on available information, ACM does not appear to be widespread within the buried wastes at the sulfur pad.

Elevated levels of phosphorus were detected in shallow soils in the vicinity of the former rock phosphate storage area. Elevated levels of acidity were identified in shallow soils in the eastern portion of the sulfur pad area which are likely to be associated with the former acid plant which was located at the eastern boundary of the sulfur pad 2013 investigation area.

The 2013 investigation also involved the characterisation of stockpiles of 'lime solids' waste in the western portion of the sulfur pad area. At the time of classification an estimated 5230 cubic metres of lime solids waste remained stockpiled on the site. These wastes were historically excavated from effluent disposal ponds located north of the sulfur pad area. The wastes were produced from the reaction between fluorosilicic acid (liquid 'den scrubber' effluent) and hydrated lime (used to neutralise the acid wastes). Sampling and analysis of the lime solids found them to contain metals (such as cadmium, mercury and lead) and high levels of fluoride (up to 10 percent by weight). The lime solids

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were found to be acidic and potentially a source of leachable fluoride and lead.

Further detailed site investigations were undertaken during 2018 across the site targeting identified data gaps. These works are summarised below.

Lead-impacted soils in the sulfur pad area were further investigated and confirmed to be localised in nature. Several soil samples reported lead at concentrations exceeding Ecological Investigation Levels and Health Investigation Levels for commercial and industrial land, as published in the 'National Environment Protection (Assessment of Site Contamination) Measure 1999' (the NEPM). An estimated 220 cubic metres of lead-impacted material remains at the site which poses a potential risk to human health and requires ongoing management.

Soil investigations at the former acid plant found elevated metals, nutrients sulfate and acidity. The concentrations of lead in three locations exceeded ecological and health-based investigation levels for commercial and industrial land, as published in the NEPM.

Further characterisation of the stockpiled lime solids confirmed that metal concentrations were below relevant ecological and health-based investigation levels for commercial and industrial land, as published in the NEPM. Soil samples were also undertaken collected from natural soils beneath the stockpiled lime solids. These samples contained relatively low levels of metals and nutrients and were alkaline, indicating limited vertical leaching had occurred from the lime solids.

Soil investigations at the location of the former cooling tower did not identify any evidence of historical fluoride waste disposal.

Soil investigations were also undertaken at the former lime solids ponds located to the north of sulfur pad. Lead was identified in two locations at concentrations exceeding ecological and health-based investigation levels for commercial and industrial land, as published in the NEPM.

A visual inspection of the oil and fuel storage area and workshop did not identify any evidence of contamination (such as poor housekeeping or stained soils) and therefore intrusive investigations were not deemed necessary.

A soil investigation was undertaken in the south-eastern corner of the site to investigate the source of elevated nutrients and acidity detected in groundwater. High concentrations of phosphorus were detected in shallow soils correlating with the alignment of a former railway siding. Anecdotal information indicates empty railway carts were historically parked in this area and residual superphosphate fertiliser in the carts was swept out onto the soil surface. This area was subject to targeted remediation in June 2019, with approximately 200 cubic metres of phosphorus-impacted surface soils being excavated and reused off-site as fertiliser.

A number of environmental management improvements were implemented at the site during the 1980s after it was recognised that industrial discharges from the site were impacting the nearby Princess Royal Harbour estuarine environment. These improvements included the construction of a network of bitumen-lined drains to intercept surface water. In the early 1990s the sulfur pad was covered in compacted lateritic gravel with the intention of reducing infiltration and leaching. Unlined drains were constructed around the southern, northern and western perimeter of the former fertiliser works which seasonally intercept groundwater. Tree plantations were also established on-site and off-site to reduce groundwater flow into the harbour, and for the direct uptake of excess nutrients from groundwater.

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Stormwater from the site's lined drainage system is directed to a lined pond in the south-western corner of the site. Water within the lined pond is treated through an onsite water treatment plant which removes nutrients (principally phosphorus) prior to discharge via a v-notch weir to the Munster Hill Drain. Intercepted groundwater from the unlined drains is directed to an unlined pond adjacent to the lined pond. Subject to capacity, water within the unlined pond is opportunistically pumped to the lined pond for treatment prior to discharge. The stormwater management controls at the site (including the treatment system and related discharge limits) are subject to the site's licence under Part V of the 'Environmental Protection Act 1986' (EP Act).

Groundwater at and in the vicinity of the site has been monitored since the 1980s and, at the time of classification, continued to be monitored on a periodic basis in accordance with the site's licence under the EP Act. Groundwater monitoring found that historical activities associated with the former fertiliser works had resulted in the contamination of shallow groundwater. Key contaminants of concern included nutrients (phosphorus and nitrate), metals, acidity, fluoride and sulphate.

Groundwater quality within the south-eastern portion of the site has been impacted by off-site sources, such as the municipal landfill located to the north-east. Landfill leachate impacts to groundwater are characterised by elevated levels of metals, nutrients (in particular ammonia) and total dissolved solids (TDS). The landfill has been classified separately under the Act and at the time of classification is subject to ongoing investigations.

A review of groundwater was undertaken between 2013 and 2014 for the purposes of the Act. These works included the installation and sampling of an additional 20 groundwater monitoring wells. Groundwater across the site was found to be impacted by elevated levels of nutrients, metals, acidity and fluoride.

At the time of classification the most recent groundwater data available to the department was collected during the course of the 2018 detailed site investigations. These works included the installation of additional monitoring wells to characterise potential groundwater impacts associated with the areas of concern identified during the preceding data gap analysis.

Groundwater in the vicinity of the sulfur pad is highly acidic, with pH values less than 3 in some monitoring locations. Concentrations of lead in groundwater near the sulfur pad (where lead-impacted soils remain) are generally low and appear to be decreasing over time. Concentrations of lead in recent years have been well below assessment levels relevant to the non-potable use of groundwater, as published in the guideline 'Assessment and management of contaminated sites' (DER, 2014). Historically, concentrations of lead in groundwater have marginally exceeded assessment levels for marine waters (DER, 2014). These are relevant criteria given that shallow groundwater discharges into Princess Royal Harbour. The metals cobalt and cadmium have also been detected in groundwater at concentrations exceeding marine water guideline levels. However, the concentrations of metals in groundwater down-hydraulic gradient of the sulfur pad are low and generally below the marine water assessment level.

Groundwater in the vicinity of the operational area remains contaminated with nutrients (total nitrogen and phosphorus) at concentrations exceeding
South-west Australian aquatic ecosystems guidelines specified in Table 3.3.6 in the "Australian and New Zealand Guidelines for Fresh and Marine Water Quality" (Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ), 2000). Nutrient-impacted groundwater represents a potential source of nutrient loading into the nearby Princess Royal Harbour. Groundwater monitoring down-hydraulic gradient of the site indicates that natural attenuation processes are likely to reduce

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the mass of nutrients entering the harbour via direct groundwater discharge.

Impacted groundwater on-site seasonally discharges into the Munster Hill Drain which runs along the site's western boundary before discharging into the harbour via Robinson Drain. A review of surface water quality was undertaken in 2014 to support a review of the site's discharge criteria under the EP Act licence. This review identified elevated levels of nutrients within the Munster Hill Drain upstream of the site's licensed discharge point. However, the site's nutrient contributions to the harbour were estimated to be proportionally higher than would be expected given that the site's water flow represents only three per cent of the overall water flow into the harbour via the Munster Hill and Robinson drains. At the time of classification the discharge of wastewater from the site is subject to conditions under the site's EP Act licence.

A risk assessment has indicated that the contamination present on the site does not currently pose an unacceptable risk to human health, the environment or environmental values under the current commercial/industrial landuse. However, the contamination may present an unacceptable risk to human health under a more sensitive land use.

A site management plan, dated May 2020, defines the nature and extent of residual contamination and sets out ongoing management measures, such as avoiding exposure with soil contamination and ongoing groundwater monitoring.

The site is contaminated, but small areas of soil have been remediated and the site continues to be regulated under Part V of the 'Environmental Protection Act 1986', such that it is suitable for the existing commercial/industrial land use. The site is not suitable for a more sensitive land use (e.g. residential housing, childcare centres) and therefore the site is classified as 'remediated for restricted use'.

A memorial stating the site's classification will be placed on the certificate of title, and will trigger the need for further investigations and risk assessment should the site be proposed for a more sensitive land use.

The department, in consultation with the Department of Health, has classified this site based on the information available to the department at the time of classification. It is acknowledged that the contamination status of the site may have changed since the information was collated and/or submitted to the department, and as such, the usefulness of this information may be limited.

Other Relevant Information:

Additional information included herein is relevant to the contamination status of the site and includes the department's expectations for action that should be taken to address potential or actual contamination described in the Reasons for Classification.

Where the land is part of a transaction - sale, mortgagee or lease agreement, the land owners MUST PROVIDE WRITTEN DISCLOSURE (on the prescribed Form 6) of the site's status to any potential owner, mortgagee (e.g. financial institutions) or lessee at least 14 days before the completion of the transaction. A copy of the disclosure must also be forwarded to the department.

As a prescribed premise, the site is currently licensed under Part V of the 'Environmental Protection Act 1986'.

Action Required:

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	Due to the presence of substances of concern in soil and exceeding aesthetic assessment levels in groundwater, site specific operational procedures are recommended to address risks posed to workers and potential aesthetic issues as outlined in the site management plan dated May 2020, and any subsequent revisions to the plan.
Certificate of Title Memorial	Under the Contaminated Sites Act 2003, this site has been classified as "remediated for restricted use". For further information on the contamination status of this site, please contact Contaminated Sites at the Department of Water and Environmental Regulation.
Current Regulatory Notice Issued	**Type of Regulatory Notice:** *Nil* **Date Issued:** *Nil*
General	No other information relating to this parcel.

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Receipt No:
ID No: 72939

Search Results

This response relates to a search request received for:

198 Hanrahan Rd
Mount Elphinstone, WA, 6330

This parcel belongs to a site that contains 4 parcel(s).

According to Department of Water and Environmental Regulation records, this land has been reported as a known or suspected contaminated site.

Address	198 Hanrahan Rd Mount Elphinstone, WA, 6330
Lot on Plan Address	Lot 201 On Plan 76615
Parcel Status	**Classification:** 26/02/2021 - *Remediated for restricted use* **Nature and Extent of Contamination:** Metals (such as cadmium, copper and lead) and fluoride are present in soils in the north-eastern corner of the site associated with the historical disposal of industrial waste. Metals (such as iron, aluminium, cobalt and zinc), acidity, and nutrients (such as ammonia and phosphorus) are present in groundwater across the site. Historical sand quarrying activities extended into this area. Limited information is available regarding the potential disposal of wastes and detailed soil investigations have not been undertaken. **Restrictions on Use:** The land use of the site is restricted to the existing passive agricultural use, which excludes sensitive uses with accessible soil such as residential development, childcare centres, kindergartens, pre-schools and primary schools. The site should not be developed for a more sensitive use such as residential use, recreational open space, residential use or childcare centres without further contamination assessment and/or remediation. Due to the presence of lead-impacts in soil in the north-eastern portion of the site the ongoing Site Management Plan dated 8 May 2020 (and any subsequent revisions) must be implemented for any intrusive works that my intercept contaminated soil. **Reason for Classification:** This site comprises land parcels located south of Lower Denmark Road in Mount Elphinstone and is known as 'CSBP Albany Area D south'. This site was reported to the Department of Water and Environmental Regulation (the department) as per reporting obligations under section 11 of the 'Contaminated Sites Act 2003' (the Act), which commenced on 1 December 2006.

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The site was reported along with other parcels of land to the north as it comprised a portion of a superphosphate fertiliser manufacturing facility. At the time of classification, land comprising the former fertiliser works (Area D north) is used for fertiliser storage and dispatch and is classified separately under the Act.

A preliminary site investigation in 2004 identified that the north-eastern portion of this site was historically used as a sand quarry up until the 1960s. The quarry void was subsequently used for the disposal of industrial wastes associated with the nearby fertiliser works. Wastes disposed included neutralised lead sulphate chamber washings, and contaminated sediments dredged from drainage systems during the 1980s. At the time of classification, the site was used for passive agricultural uses, including a tree plantation.

Fertiliser production, extractive industries and landfilling are land uses which have the potential to cause contamination, as specified in the guideline 'Assessment and management of contaminated sites' (Department of Environment Regulation [DER], 2014).

Remedial works were historically undertaken at this site which involved the excavation and off-site disposal of lime solids waste. It is understood that remedial works were guided by in-field x-ray fluorescence measurements and included the collection of soil validation samples. However, limited documentation was prepared at the time to demonstrate the effectiveness of these remedial works.

A targeted soil investigation was undertaken in 2018 as part of a broader detailed site investigation. Elevated concentrations of metals, such as lead, cadmium and copper, were identified at depths up to 1.5 metres below ground level. The concentrations of copper in soil marginally exceeded Ecological Investigation Levels for urban residential land and public open space, as published in the 'National Environment Protection (Assessment of Site Contamination) Measure 1999' (the NEPM). The concentrations of cadmium in soil marginally exceeded generic Ecological Investigation Levels as published in Assessment Levels for Soil, Sediment and Water' (Department of Environment and Conservation, 2010) (adopted in the absence of an ecological criterion in the NEPM).

Lead was detected in soil at two locations in the northern portion of the former quarry at concentrations exceeding Health Investigation Levels for residential land with accessible soil, as published in the NEPM. These are relevant criteria given that the land is zoned 'rural small lot holdings' and may be used for residential purposes in the future. In one location the concentration of lead also exceeded Ecological Investigation Levels for urban residential land and public open space, as published in the NEPM.

Soil samples were also analysed for fluoride, a contaminant of concern associated with the industrial wastes disposed at the site. Concentrations of total fluoride were elevated in the limited samples analysed, whereas concentrations of 'water soluble fluoride' were consistently low.

The soil investigations indicate that the historic remedial works were largely successful, however, some residual soil contamination remains.

Groundwater monitoring as has been undertaken for several decades to characterise the nature and extent of groundwater contamination associated with the historical fertiliser works. This groundwater monitoring also included the sampling of monitoring wells located across this site. At the time of classification, the most recent groundwater monitoring data available was from December 2018.

Groundwater at the site has been found to be acidic and have elevated concentrations of some metals (such as aluminium and iron) and fluoride. The elevated concentrations of aluminium and iron

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are associated with the acidic groundwater conditions which are likely caused, in part, by the presence of naturally occurring acid sulfate soils in the area.

The concentrations of other metals, such as lead, cadmium and copper were not detected at elevated concentrations, indicating that the historical disposal of fertiliser works waste has not resulted in significant groundwater contamination at the site. Elevated concentrations of fluoride have been detected in groundwater, with the highest concentrations detected immediately down-hydraulic gradient of the former waste disposal area. However, the concentrations detected have not exceeded assessment levels for the non-potable use of groundwater, as published in the guideline 'Assessment and management of contaminated sites' (DER, 2014).

Ammonia, iron and aluminium are present in groundwater at concentrations exceeding aesthetic-based assessment levels for the non-potable use of groundwater, as published in the guideline 'Assessment and management of contaminated sites' (DER, 2014).

Phosphorus and the metals cobalt and zinc have been detected in groundwater at concentrations marginally exceeding assessment levels for marine waters, as published in 'Assessment and management of contaminated sites' (DER, 2014). These are relevant criteria given the estuarine environment of Princess Royal Harbour approximately 800m south-east of the site. However, given the marginal nature of the exceedances and the attenuation processes that would occur prior to discharge into the harbour, groundwater quality at the site is not considered to pose an unacceptable ecological risk.

Periodic groundwater monitoring is being undertaken at this site as part of the ongoing environmental management of the nearby former historical fertiliser works.

Surface water bodies at the site, including a soak in the central portion of the site, and the Munster Hill Drain which intersects the north-western corner of the site, have not been specifically assessed as part of the investigation of this site. However, water quality within the soak is expected to be comparable to groundwater quality. The Munster Hill Drain has been monitored for several decades as part of the broader environmental management of Princess Royal Harbour, and the management of discharges from the former fertiliser works. The Munster Hill Drain is a known source of nutrient input into the harbour, which is a result of land uses throughout the catchment, as well as licensed discharges from the former fertiliser works site.

A risk assessment has indicated that the contamination present on the site does not currently pose an unacceptable risk to human health, the environment or environmental values under the ongoing passive agricultural land use. However, the contamination may present an unacceptable risk to human health under a more sensitive land use.

Although the site is contaminated, some undocumented soil remediation is believed to have occurred in the past such that the site it is suitable for the current passive agricultural land use. The site is not suitable for a more sensitive land use (e.g. residential housing, childcare centres) and therefore the site is classified as 'remediated for restricted use'.

A memorial stating the site's classification will be placed on the certificate of title, and will trigger the need for further investigations and risk assessment should the site be proposed for a more sensitive land use.

The department, in consultation with the Department of Health, has classified this site based on the information available to the department at the time of classification. It is acknowledged that the

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	contamination status of the site may have changed since the information was collated and/or submitted to the department, and as such, the usefulness of this information may be limited. In accordance with Department of Health advice, if groundwater is being, or is proposed to be abstracted, the department recommends that analytical testing should be carried out to determine whether the groundwater is suitable for its intended use. **Other Relevant Information:** Additional information included herein is relevant to the contamination status of the site and includes the department's expectations for action that should be taken to address potential or actual contamination described in the Reasons for Classification. Where the land is part of a transaction - sale, mortgagee or lease agreement, the land owners MUST PROVIDE WRITTEN DISCLOSURE (on the prescribed Form 6) of the site's status to any potential owner, mortgagee (e.g. financial institutions) or lessee at least 14 days before the completion of the transaction. A copy of the disclosure must also be forwarded to the department. Based on available information, industrial waste disposal does not appear to have extended into Lot 1 on Diagram 5668 or the portion of Lot 201 identified with PIN 12038206. However, based on a review of available historical aerial imagery, sand quarrying operations did extend into this portion of the site. Therefore, given the potential for waste disposal in former quarry voids, and the lack of detailed soil investigations in this area, these land parcels are also classified as 'remediated for restricted use' and will require further investigations if proposed for a more sensitive use. **Action Required:** Please refer to the Restrictions on Use applicable to the site. Ongoing groundwater monitoring should continue to be undertaken at this site in conjunction with groundwater monitoring activities at the nearby former fertiliser works. The groundwater monitoring is to be undertaken in accordance with the Site Management Plan dated 8 May 2020 (and any subsequent revisions of this plan).
Certificate of Title Memorial	Under the Contaminated Sites Act 2003, this site has been classified as "remediated for restricted use". For further information on the contamination status of this site, please contact Contaminated Sites at the Department of Water and Environmental Regulation.
Current Regulatory Notice Issued	**Type of Regulatory Notice:** *Nil* **Date Issued:** *Nil*
General	No other information relating to this parcel.

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Appendix F Aboriginal Heritage Enquiry System Search Records

Legend
- Project area

Aboriginal heritage places (DPLH-001)
- Other heritage place

Scale: 1:7,000 at A4
0 50 100
metres

Coord. Sys. GDA2020 MGA Zone 50

Job Number: 62317

Client: Rowe Group

Version: A | Date: 01-Sep-2022

Drawn By: cthatcher | Checked By: NM

HERITAGE SITES

FIGURE 3.12

strategen JBS&G

File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\Rowe\62317 Woolstores Pl Structure Plan Env Studies\GIS\Maps\R01\62317_Woolstores_Pl_R01_V1.aprx
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B	Jack Nichol	Penelope King	DRAFT FOR ISSUE		27/09/2023

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Sampling and Analysis Quality Plan (SAQP)

Woolstores Place, Mount Elphinstone, WA

Rowe Group

66001 | 155,373 (Rev A)

24 November 2023

We acknowledge the Traditional Custodians of Country throughout Australia and their connections to land, sea and community.

We pay respect to Elders past and present and in the spirit of reconciliation,
we commit to working together for our shared future.

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1. Introduction and Background

1.1 Introduction

JBS&G Australia Pty Ltd (JBS&G) was commissioned by Rowe Group (the 'client') to prepare a Sampling and Analysis Quality Plan (SAQP) for the ten (10) lot parcel of land at Woolstores Place, Mount Elphistone (the site). The site includes the cadastral lots as detailed in Table 1-1 below. The site location and layout are presented in **Figure 1** and **Figure 2,** respectively.

Table 1-1: Site Lot Details

Lot address	Certificate of title	Lot area (ha)
34 Woolstores Place	Lot 1104 on Deposited Plan 165964	2.00
34 Woolstores Place	Lot 1209 on Deposited Plan 173935	3.36
34 Woolstores Place	Lot 895 on Deposited Plan 161301	4.05
34 Woolstores Place	Lot 1350 on Deposited Plan 184224	0.43
N/A	Lot 1156 on Deposited Plan 171141	0.20
N/A	Lot 1157 on Deposited Plan 171141	2.25
23 Woolstores Place	Lot 141 on Deposited Plan 27076	0.20
23 Woolstores Place	Lot 142 on Deposited Plan 416233 (formerly known as part Lot 140 on Deposited Plan 27076)	1.56
15 Woolstores Place	Lot 111 on Deposited Plan 416232 (formerly known as part Lot 11 on Diagram 53535)	0.43
N/A	Lot 44 on Deposited Plan 171141	0.30

1.2 Background

JBS&G completed a Preliminary Site Investigation (PSI) for the site in 2022/2023 (JBS&G 2023)[1] with the objective of assessing the nature of current or historical potentially contaminating activities that may have occurred within the site or on adjacent properties. The key findings of the PSI relating to potential contamination are summarised below.

Former Site Structures and Stockpiled Soil

The site investigation included an assessment for Potentially Asbestos Containing Material (PACM) associated with demolition and dilapidation of former site structures and stockpiled soils. Fragments of PACM were observed at multiple locations during the site inspection. The presence of PACM fragments presents a potentially unacceptable health risk to future residents and construction workers, as well as an aesthetic risk. The potential for fibre generation during civil works also poses a risk to on-site receptors.

Stockpiled soil was also present within the site. Stockpiled soil on the Woolstores lots was observed to contain a combination of building rubble, sheet metal, steel and PACM.

Illegal Dumping/ Fly Tipping

Along the eastern portion of the Woolstores lots, illegal dumping/ fly tipping was observed. Fragments of PACM were observed at multiple locations during the site inspection. The presence of PACM fragments and other COPCs associated with fly tipping (metal pipes, steel framework, sheet metal, concrete, paint tins, bricks,

[1] *Preliminary Site Investigation, Woolstores Place, Western Australia,* JBS&G Australia Pty Ltd, 27 February 2023.

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tyres etc.) presents a potentially unacceptable health risk to future residents and construction workers, as well as an aesthetic risk.

Potential Uncontrolled Fill

The Woolstores site has been built on reclaimed land. There is a potential risk associated with the unknown nature and extent of the imported material. During the preliminary site investigation, PACM fragments were observed within the fill material that was used to create site levels as they are today. The uncontrolled fill presents a potentially unacceptable health risk to future residents and construction workers, as well as an aesthetic risk.

At the time of inspection, a limestone road base had been imported to assist with site levels off-site. The limestone road base originated from virgin quarry material[2]. As the material has been directly sourced from a quarry, the potential for contamination from this material to migrate on-site is considered negligible. It should be noted that the imported limestone clean fill is off-site as the site boundary has changed since the investigation was initiated.

Historical Land Uses

The Woolstores site has been subject to commercial/ industrial land uses for roughly 70 years. There is potential for site wide contamination associated with these historical potentially contaminating activities to exist. The Woolstores site while operational was used as a wool storage facility with truck and machinery access. During the PSI, soak wells were observed but the linings were unable to be visually assessed. Further assessment to determine whether the soak wells are lined or unlined is required. Most of the site is also unsealed creating a potential pathway for contaminants from onsite activities to leach through the soil profile to impact groundwater.

Migration of Potentially Contaminated Groundwater from Up-gradient Properties

The PSI identified various up-gradient properties that are impacted by contaminated groundwater. Based on the information reviewed, it is possible that these impacts have migrated on-site. General regional groundwater quality is known to be acidic. As future land uses on-site are proposed to be a combination of residential and mixed commercial uses, there is a risk that site receptors may come into contact with this contaminated groundwater if abstracted for use. Groundwater in the local area is also relatively shallow (<2m bgl).

Acid Sulfate Soils

The DWER (2015) guidance states that in areas of 'High to Moderate risk' of ASS occurring, an ASS investigation is required prior to the following ground disturbance activities:

- Earthworks that will disturb more than 100 m^3 of soil.
- During dewatering or soil draining activity.

Given the site's aim is for re-zoning to a residential land use it is likely that both the ground disturbance events above will occur. This will, therefore, trigger the requirements for ASS investigation.

Recommendations

Based on the PSI conclusions, the following recommendations were made.

[2] Mainroads Western Australia – Great Sothern Region – ARR Material Summary, Armstrong's Gravel Pit, Main Roads Limestone Pit.

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- Further assessment or management/remediation of the potentially impacted soils and groundwater identified in the PSI should be considered to assess the potential risks to future site receptors. It was noted that an intrusive sampling program should be considered to characterise impacts associated with the Areas of Potential Environmental Concern (APEC) identified.
- It was recommended that JBS&G provide a scope for a Sampling Analysis and Quality Plan (SAQP) to inform a Detailed Site Investigation (DSI) in order to characterise the nature, extent and risk of potential contamination onsite (site derived and offsite migration).
- It was recommended that waste material identified on site, derived from the illegal dumping/fly tipping activity is removed and disposed of off-site appropriately at the time of demolition, prior to the completion of further investigative activities.

1.3 Objectives

The objective of the SAQP is to document the intrusive works required for the site to adequately assess the nature and extent of potential contamination issues identified in the PSI (JBS&G 2023).

The aims of this SAQP are to detail the following:

- Methodology that will be adopted for investigation works.
- Procedures and protocols that will be adopted for the laboratory analysis program.
- Other field procedures in accordance with the requirements of relevant guidelines.
- Data interpretation and reporting.

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2. Site Condition and Surrounding Land Use

2.1 Site Details

The site details are summarised in Table 2-1.

Table 2-1: Site Details

Site Address & Lot ID	34 Woolstores Place (Lot 1104 on Deposited Plan 165964) 34 Woolstores Place (Lot 1209 on Deposited Plan 173935) 34 Woolstores Place (Lot 895 on Deposited Plan 161301) 34 Woolstores Place (Lot 1350 on Deposited Plan 184224) 23 Woolstores Place (Lot 141 on Deposited Plan 27076) Lot 142 on Deposited Plan 416233 (formerly known as part of 23 Woolstores Place, Lot 140 on Deposited Plan 27076) Lot 111 on Deposited Plan 416232 (formerly known as part of 15 Woolstores Place, Lot 11 on Diagram 53535) N/A (Lot 1156 on Deposited Plan 171141) N/A (Lot 1157 on Deposited Plan 171141) N/A (Lot 44 on Deposited Plan 171141)
Approximate Coordinates of Estate Boundary (UTM)	N Corner = -35.023117, 117.859034
	E Corner = -35.026987, 117.867681
	W Corner = -35.026381, 117.856086
	S Corner = -35.027743, 117.856934
Site Area (ha)	14.78
Site Owner(s)	Mainbeam PTY LTD – Lot 1156, Lot 1157, Lot 895, Lot 1104, Lot 1209, Lot 141, Lot 142, Lot 111. State of Western Australia – Lot 44 (unallocated), Lot 1350 (vested with City of Albany)
Site Operator	The site is currently non-operational and undergoing demolition.
Current Land Use	The site is currently non-operational and undergoing demolition.
Former Land Use	Rural residential properties, and commercial/ industrial warehouse housing the Albany Woolstores and associated activities.
Proposed Land Use	Mixed use, including commercial uses and residential R50, R80, R100 and R160; neighbourhood centre; public open space (POS).
Local Government Authority	City of Albany
Zoning	Rural (Small Lot Holdings), General Industry and Park and Recreation (Albany Local Planning Scheme No. 1)
Proposed Zoning	Mixed Use – Residential and Commercial Spaces
Site Classification	Currently not classified

2.2 Site Inspection

On 4-5th July 2022, an experienced JBS&G environmental scientist undertook a site inspection as part of the PSI (2022). The observations made have been separated into two tables. Table 2-2 summarises the site inspection findings for the undeveloped northern rural properties and summaries for the large

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commercial warehouses present are summarised in Table 2-3 below. **It is noted that the site conditions will have changed significantly since the July 2022 site inspection as decommissioning and demolition activities have progressed across the site. Based on information provided by the client, it is anticipated that at the time of DSI implementation, all site infrastructure will have been demolished, and waste materials (including stockpiles), will have been removed from site.**

Table 2-2: Site Inspection Findings Summary – Northern Rural Properties[3]

Aspect	Observations
Accessibility	Access to these lots is via Woolstores Place, there is a main driveway that allows access to each of the residential properties. At the time of inspection, the northern Rural Residential Properties remained undeveloped, although clean limestone road base has been imported to the north of the site (outside the site boundary) for construction activities and assisting in site levels.
Topography	The lots are generally flat, with a progressive slope to the south toward Lockyer Bay. Ground levels as depicted on Landgate range from 1 – 2 m AHD. There are surface water expressions present.
Surface drainage	All soils on site comprise of permeable sand, therefore most of the drainage onsite will be through infiltration at site surface.
Site nature and condition	Most of the site is undeveloped. There is remnant vegetation present.
Visible signs of contamination	There were no notable visible signs of contamination.
On-site buildings and other infrastructure	The site did not contain infrastructure. The only buildings and other infrastructure that were present onsite at the time of inspection were the demountable dongas for the civil works being undertaken to the north (off-site).
Aesthetic issues	No odours or visual signs of contamination were detected, and general housekeeping was appropriate.
Stockpiled material	There was a large stockpile of material located to the north (off-site), most likely associated with the topsoil scrape of the site before the fill was imported. The extent of the material is estimated to be circa 765m^3. As this material was located off-site, no further assessment was undertaken.
Presence of PACM	No PACM was observed
Groundwater bores	No groundwater bores were observed
Surrounding land use	The surrounding land is used for rural residential, general industry and parks and recreation purposes.

Table 2-3: Site Inspection Findings Summary – Commercial/ Industrial Warehouses[4]

Aspect	Observations
Accessibility	Access to these lots is via Woolstores Place, there is a main driveway that allows access the lots. The boundary of the lots is demarcated by temporary fencing.
Topography	The lots are generally flat, with a progressive slope to the south toward Lockyer Bay. Ground levels range from 1 – 2 m AHD.
Surface drainage	All soils on site comprise of permeable sand, therefore most of the drainage onsite will be through infiltration at site surface. There were various drains and sumps present on site.
Site nature and condition	At the time of inspection, the warehouse located on Lot 895 had been partially demolished with all roofing and wall structures removed. The warehouse to the south was still in good condition with only roughly 10% of roofing panels removed.

[3] Northern Rural Properties – Lot 141 on DP 27076, Lot 140 on DP 27076, Lot 11 on D 53535, Lot 1157 on DP 171141, Lot 44 on DP 171141.

[4] Lot 1104 on DP 165964, Lot 1209 on DP 173935, Lot 895 on DP 161301, Lot 1350 on DP 184224.

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Aspect	Observations
Visible signs of contamination	No gross contamination was observed. Fugitive PACM fragments were found around the warehouses and within the imported fill material along the southern and eastern boundary of the site.
On-site buildings and other infrastructure	Two historical warehouses associated with the historical Woolstores operations were present at the time of inspection. Both were in the process of being demolished. Roofing panels on both buildings comprised predominantly of PACM.
Aesthetic issues	No odours were detected, however, at the time of inspection the site was covered in demolition material from the warehouses.
Stockpiled material	Stockpiled material was present throughout site with construction and demolition waste, including PACM, scattered throughout the site
Presence of PACM	PACM (in the form of fibre-cement sheeting) was observed around the warehouses and within the imported fill material along the southern and eastern boundary of the site.
Groundwater bores	Three groundwater bores were observed around the boundary of the site.
Surrounding land use	The surrounding land is used for residential, public open space and mixed purposes

2.3 Surrounding Land Use

Under the Albany Local Panning Scheme 1, the site is bordered by Urban Residential and General Industry. The surrounding land uses are depicted in Figure 1.

Further details on the surrounding land use are presented in Table 2-4.

Table 2-4: Surrounding Land Use

Location	Detail
North	The site is bounded by a priority road (Frenchman Bay Road) and a railway. Further to the northeast is remnant bushland zoned as parks and recreation. Northwest of the site is zoned as rural with small lot holdings.
East	Directly east of the site is the rail line and Princess Royal Drive (major road). There are residential dwellings further east
South	The site is bound by Frenchman Bay to the south.
West	Land to the west is zoned as Tourist/ Residential with various tourist accommodation and residential dwellings.

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3. Desktop Study

A desktop study of the site's environmental setting and history was undertaken as part of the PSI (JBS&G 2023) with key aspects summarised herein.

3.1 Environmental Setting

3.1.1 Topography

A detailed site features survey provided by the client indicates an elevation of ~6.7 m AHD in the northern portion of the rural residential lots, with an elevation of ~2.7 m AHD in the southern portion of the commercial/ industrial lots near the coast. Based on the elevation difference between the current Lots 1209 and 1104 and adjacent unfilled (based on historical aerial imagery) Lot 52, it is considered likely that approximately 1.5 m to 2 m of fill was placed across the commercial/ industrial lots to achieve the current site levels.

3.1.2 Hydrology

There is one permanent surface water body on site, this is located on Lot 11 on Diagram 53535. Lockyer Bay is located immediately south of Lot 1209 on Deposited Plan 173935.

3.1.3 Geology

The site is located within the Albany-Fraser Orogen Nornalup Complex range formation, comprising of gneiss, metamorphic rock and granitoid.

GeoVIEW.WA indicates that the site is largely located within an area of depositional sediments derived from residual or erosional landforms; including colluvial, sheetwash, alluvial, lacustrine, sandplain, eolian and marine deposits of variable thickness.

Acid Sulphate Soils

Acid sulfate soils (ASS) are naturally occurring, iron-sulfide rich soils, sediments, or organic substrates, formed under waterlogged conditions. If exposed to air, these sulfides can oxidise and release sulfuric acid and heavy metals. This process can occur due to drainage, dewatering or excavation.

The ASS risk mapping available from the Australian Soil Resource Information System (ASRIS) (2013) and DWER (2017). The site is classed as having a 'High Probability of Occurrence' (ASRIS 2013) and/or 'High to Moderate risk' (DWER 2017) of ASS occurring within 3 m of the natural soil surface that could be disturbed by most land development activities. The DWER (2015) guidance states that in areas of 'High to Moderate risk' of ASS occurring, an ASS investigation is required prior to the following ground disturbance events:

- Earthworks that will disturb more than 100 m^3 of soil.
- During dewatering or soil draining activity.

3.1.4 Hydrogeology

According to data published by the DWER in the Perth Groundwater Atlas (PGA), the site is underlain by the Bremer West Superficial Sediment Aquifer.

Given the site's proximity to the coast, groundwater levels range from approximately 7.5 metres below ground level (m bgl) to less than 1 m bgl. Groundwater flow direction within the site broadly flows southward, toward the coast.

Groundwater quality in the area is noted to be from fresh to saline, with approximate total dissolved solid (TDS) measurements between 100 – 100,000 mg/L. The site does not fall within a Public Drinking Water Source Areas (PDWSA), with the closest PDWSA being approximately 1km west of the site.

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Groundwater Bore Search

A review of the Department of Water and Environmental Regulation (DWER) Water Register indicates that there are 0 licensed[5] groundwater abstraction bores located within a 1.0 km radius of the site. The closest abstraction bore is located approximately 1.2km west of the site.

There are 10 registered bores within 500 m of the site, all of which are located within the boundary of the site. The details of the bores registered within the boundary of the site is summarised in Table 3-1 below. It is recognised that in WA in most instances there is no requirement to obtain a license for a domestic groundwater bore.

Table 3-1: Registered Groundwater Bore Details

Licence #	Drill Depth (m bgl)	Bore Use	Direction and distance from centre of site	Additional information
60210190	4 m bgl	Groundwater bore	310 m southwest	Department of Water
60210191	4 m bgl	Groundwater bore	320 m southwest	Department of Water
60210112	5.5 m bgl	Groundwater bore	300 m northeast	Department of Water
60210113	9.8 m bgl	Groundwater bore	300 m northeast	Department of Water
60210114	15.2 m bgl	Groundwater bore	300 m northeast	Department of Water
60210115	4 m bgl	Groundwater bore	In centre of Site	Department of Water
60210116	8.3m bgl	Groundwater bore	In centre of Site	Department of Water
60210117	11.2 bgl	Groundwater bore	In centre of Site	Department of Water
60210118	14.3 m bgl	Groundwater bore	In centre of Site	Department of Water
60210411	15.2 m bgl	Groundwater bore	350 m northwest	CSBP

3.2 Site History Summary

3.2.1 Historical Aerial Review

Historical aerial photographs have been reviewed in order to gain an understanding of the historical use of the site, and to identify areas and activities of potential environmental concern with respect to contamination. A summary of the available aerial images from Landgate 'Map Viewer Plus' were reviewed as part of the investigation and are summarised in Table 3-2.

[5] There is a requirement to obtain a groundwater abstraction licence where groundwater is used for commercial/industrial purposes (e.g. process water), especially if abstraction is occurring from deeper confined aquifers. There may be additional unregistered groundwater wells in the area.

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Table 3-2: Summary of Historical Aerial Photograph Observations

Date	General Observation	Lot Specific Observations
1954	• First available photograph, Woolstores place seems to be a sealed road. • The surrounding land remains mainly uncleared.	• All lots remain uncleared with the exception of Lot 895 which contains a commercial/industrial building.
1961	• Remains largely unchanged from previous photo. • The surrounding land remains mainly uncleared.	• Lot 895 had expanded its commercial/industrial building into Lot 1104.
1977	• Land within the lots has been cleared for agricultural purposes. • Surrounding land continues with residential development to the west, and industrial/commercial development to the north.	• The expansion of the commercial/industrial building on Lot 895 has continued and now occupies Lot 895, Lot 1104 and Lot 1209. • Lot 1209 has been filled to reclaim land for the warehouses to be built on. • Lot 140 further development of residential property at northern part of the lot.
1988	• Remains largely unchanged from previous photograph. • Commercial/industrial development continues to the north and east of the lots.	• Remains largely unchanged from previous photograph. • A surface water body has appeared on Lot 140
1996	• Remains largely unchanged from previous photograph. • Commercial/industrial development continues to the north and east of the lots.	• Residential building developed on Lot 11.
2007	• Remains largely unchanged from previous photograph. • Commercial/industrial development continues to the north of the lots.	• The commercial/industrial building that crosses over Lot 895 and Lot 1104 has been demolished.
2012	• Remains largely unchanged from previous photograph.	• Remains largely unchanged from previous photograph.
2018	• Remains largely unchanged from previous photograph. • Commercial/industrial development continues to the north of the lots.	• Lot 140 has developed a dam like structure along the eastern border of the lot. • Surface water bodies are present in Lot 141.
2020	• Remains largely unchanged from previous photograph.	• Remains largely unchanged from previous photograph.

3.2.2 Dangerous Goods Search

A dangerous goods license search request was completed on 20 May 2022 with the WA Government Department of Mines, Industry Regulation and Safety (DMIRS) for each of the site Lots. The Notice of Decision provided by DMIRS found various documents pertaining to the storage of Dangerous Goods onsite dating from 1993 – 2002. The dangerous goods documents for the site related to the storage of a 3.8 kL Liquid Petroleum Gas Tank from 1993 to 2002. The latest correspondence with DMIRS in relation to the storage of the tank was in 2002. The letter stated, *"The Albany Woolstores are no longer in operation and the gas tank has been removed."*

3.2.3 DWER Records

Site Records

A BSR Request was submitted to DWER for each of the Lots on 20 May 2022. A search of the department's records indicate that the site has not been reported to the department as a known or suspected contaminated site.

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Surrounding Properties

Seven (7) properties within a 1 km radius have been classified as *'Remediated for restricted use"*, located north of the site. Table 3-3 provides a summary of the property details.

Table 3-3: DWER Online Contaminated Sites Database Search

Property Description	Address	Classification	Distance from Site	Reason for Classification
Lot 201 on Plan 76615	198 Hanrahan Rd Mount Elphinstone, WA, 6330	Remediated for Restricted Use (26/02/2021) ID no: 72939	820 m	A preliminary site investigation in 2004 identified that the north-eastern portion of this site was historically used as a sand quarry up until the 1960s. The quarry void was subsequently used for the disposal of industrial wastes associated with the nearby fertiliser works. Wastes disposed included neutralised lead sulphate chamber washings, and contaminated sediments dredged from drainage systems during the 1980s. At the time of classification, the site was used for passive agricultural uses, including a tree plantation. Remedial works were historically undertaken at this site which involved the excavation and off-site disposal of lime solids waste. It is understood that remedial works were guided by in-field x-ray fluorescence measurements and included the collection of soil validation samples. However, limited documentation was prepared at the time to demonstrate the effectiveness of these remedial works. A targeted soil investigation was undertaken in 2018 as part of a broader detailed site investigation. Elevated concentrations of metals, such as lead, cadmium and copper, were identified at depths up to 1.5 metres below ground level. Groundwater at the site has been found to be acidic and have elevated concentrations of some metals (such as aluminium and iron) and fluoride. The elevated concentrations of aluminium and iron are associated with the acidic groundwater conditions which are likely caused, in part, by the presence of naturally occurring acid sulfate soils in the area.
Lot 201 on Plan 76615	198 Hanrahan Rd. Mount Elphinstone, WA, 6330	Remediated for Restricted Use (26/02/2021) ID no: 72938	615 m	A superphosphate fertiliser plant historically operated on the site for approximately 47 years, from 1954 to 2001. The site has also been used for fuel and chemical storage and fertiliser dispatch for approximately 67 years, since 1954. Historically, solid, and liquid wastes were disposed on-site. Fertiliser production, fuel and chemical storage and landfilling are land uses which have the potential to cause contamination. Lead-impacted soils in the sulphur pad area were further investigated (2018) and confirmed to be localised in nature. Several soil samples reported lead at concentrations exceeding Ecological Investigation Levels and Health Investigation Levels for commercial and industrial land. An estimated 220 cubic metres of lead-impacted material remains at the site which poses a

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Property Description	Address	Classification	Distance from Site	Reason for Classification
				potential risk to human health and requires ongoing management. Anecdotal information indicates empty railway carts were historically parked in this area and residual superphosphate fertiliser in the carts was swept out onto the soil surface. This area was subject to targeted remediation in June 2019, with approximately 200 cubic metres of phosphorus-impacted surface soils being excavated and reused off-site as fertiliser. Groundwater in the vicinity of the sulfur pad is highly acidic, with pH values less than 3 in some monitoring locations. Concentrations of lead in groundwater near the sulfur pad (where lead-impacted soils remain) are generally low and appear to be decreasing over time. Concentrations of lead in recent years have been well below assessment levels relevant to the non-potable use of groundwater.
Lot 76 on Plan 26132	76 Grey St Mount Melville, WA, 6330	Remediated for Restricted Use (29/10/2018)	420 m	This site formed a portion of a larger land-holding occupied by the Albany fertiliser works. A preliminary site investigation was undertaken in 2004 which found that the site had not historically been used for any purpose related to the fertiliser works. However, the south-western portion of the site was used as a bulk fuel depot for approximately 18 years between 1956 and 1974. Soil investigations were undertaken in 2017 specifically targeting soils in the vicinity of the abandoned ASTs and other buildings associated with the former use of the site. Petroleum hydrocarbon impacts were not identified, however, an area of lead-impacted soils was identified adjacent to the opening of an unknown concrete building. The source of the lead was not known but was suspected to be associated with runoff from surfaces of the building potentially coated with lead-based paint. Remedial works were undertaken during 2018 comprising the excavation and off-site disposal of approximately half a cubic metre of lead-contaminated soils. Final validation sampling and analysis demonstrated that lead-impacted soils exceeding relevant health-based and ecological based screening criteria had been successfully remediated. Periodic groundwater monitoring has been undertaken at the site and across the broader catchment area which includes a former fertiliser manufacturing facility to the west and an operating municipal landfill to the north. These investigations have found that groundwater to the north and west of this site has been impacted by landfill leachate associated with the municipal landfill located at 37 Maxwell Street, Mount Melville. Nutrients, acidity and metals (such as iron, copper and zinc) were also identified in groundwater at levels exceeding assessment levels for marine waters (DER, 2014). These criteria are relevant given the site

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Property Description	Address	Classification	Distance from Site	Reason for Classification
				is within 500 metres of Princess Royal Harbour. However, a review of groundwater data from across the catchment area indicates that the levels of nutrients, acidity, and metals in groundwater beneath this site are indicative of background up-hydraulic gradient groundwater quality.

3.2.4 Heritage Records

Federal Heritage

A search of the Australian Heritage Trust Database[6] was undertaken on 15 June 2022 for wider site area. The search did not identify the presence of any items of national significance at, or in the immediate vicinity of the site.

Heritage Council of Western Australia

A database search of the WA State Heritage Office[7] was undertaken on 15 June 2022 for the wider site area. The search did not identify the presence of any items of state registered places at the site.

Department of Indigenous Affairs

A search of the Aboriginal Heritage Inquiry System (AHIS)[8] was undertaken on 15 June 2022. The search did not identify the presence of any heritage item on the AHIS. The closest heritage item is located immediately north of the sites and is called the Frenchman Bay Road Camp and is registered for Mythological, Camp and Natural Feature.

6 http://www.environment.gov.au/cgi-bin/ahdb/search.pl
7 http://inherit.stateheritage.wa.gov.au/Public/?advanced=True.
8 https://espatial.dplh.wa.gov.au/AHIS/index.html?viewer=AHIS.

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4. Historical Environmental Document Review

No environmental investigations are known to have been complete at the site other than the JBS&G 2023 PSI.

4.1 JBS&G (2023) Preliminary Site Investigation

JBS&G was commissioned by Rowe Group to undertake a PSI for the ten (10) Lot parcel of land at Woolstores Place (the site).

The objective of the project was to undertake a PSI, to assess the nature of current and or historical potentially contaminating activities that may have previously occurred within the site or on adjacent properties.

The following scope of works was completed in order to meet the project objectives.

- Completion of a site inspection to identify potentially contaminating activities.
- Completion of a desktop review of available client provided and publicly available information.
- Preparation of an interpretative PSI report including a Conceptual Site Model (CSM), in general conformance with the WA DWER Contaminated Sites Guidelines (2021).

The key findings of the PSI are summarised below.

Former Site Structures and Stockpiled Soil

The site investigation included an assessment for Potentially Asbestos Containing Material (PACM) associated with demolition and dilapidation of former site structures and stockpiled soils. Fragments of PACM were observed at multiple locations during the site inspection. The presence of PACM fragments presents a potentially unacceptable health risk to future residents and construction workers, as well as an aesthetic risk. The potential for fibre generation during civil works also poses a risk to on-site receptors.

Stockpiled soil was also present throughout the site. Stockpiled soil on the Woolstores lots was observed to contain a combination of building rubble, sheet metal, steel and PACM.

Illegal Dumping/ Fly Tipping

Along the eastern portion of the Woolstores lots, illegal dumping/ fly tipping was observed. Fragments of PACM were observed at multiple locations during the site inspection. The presence of PACM fragments and other COPCs associated with fly tipping (metal pipes, steel framework, sheet metal, concrete, paint tins, bricks, tyres etc.) presents a potentially unacceptable health risk to future residents and construction workers, as well as an aesthetic risk.

Potential Uncontrolled Fill

The Woolstores site has been built on reclaimed land. There is a potential risk associated with the unknown nature and extent of the imported material. During the preliminary site investigation, PACM fragments were observed within the fill material that was used to create site levels as they are today. The uncontrolled fill presents a potentially unacceptable health risk to future residents and construction workers, as well as an aesthetic risk.

At the time of inspection, a limestone road base had been imported to assist with site levels off-site. The limestone road base originated from virgin quarry material[9]. As the material has been directly sourced from a

[9] Mainroads Western Australia – Great Sothern Region – ARR Material Summary, Armstrong's Gravel Pit, Main Roads Limestone Pit.

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quarry, the potential for contamination from this material to migrate on-site is considered negligible. It should be noted that the imported limestone clean fill is off-site as the site boundary has changed.

Historical Land Uses

The Woolstores site has been subject to commercial/ industrial land uses for roughly 70 years. There is potential for site wide contamination associated with these historical potentially contaminating activities to exist. The Woolstores site while operational was used as a wool storage facility with truck and machinery access. During the PSI, soak wells were observed but the linings were unable to be visually assessed. Further assessment to determine whether the soak wells are lined or unlined is required. Most of the site is also unsealed creating a potential pathway for contaminants from onsite activities to leach through the soil profile to impact groundwater.

Migration of Potentially Contaminated Groundwater from Up-gradient Properties

Table 3.3 identified various up-gradient properties that are impacted by contaminated groundwater. Based on the information reviewed, it is possible that these impacts have migrated on-site. General regional groundwater quality is known to be acidic. As future land uses on-site are proposed to be a combination of residential and mixed commercial uses, there is a risk that site receptors may come into contact with this contaminated groundwater if abstracted for use. Groundwater in the local area is also relatively shallow (<2m bgl).

Acid Sulfate Soils

The DWER (2015) guidance states that in areas of 'High to Moderate risk' of ASS occurring, an ASS investigation is required prior to the following ground disturbance activities:

- Earthworks that will disturb more than 100 m^3 of soil.
- During dewatering or soil draining activity.

Given the site's aim is for re-zoning to a residential land use it is likely that both the ground disturbance events above will occur. This will, therefore, trigger the requirements for ASS investigation.

Recommendations

Based on the PSI conclusions, the following recommendations were made.

Further assessment or management/remediation of the potentially impacted soils and groundwater should be considered to assess the potential risks to future site receptors. It is noted that an intrusive sampling program should be considered to characterise impacts associated with the APECs identified.

It was recommended that JBS&G provide a scope for a Sampling Analysis and Quality Plan (SAQP) and subsequent Detailed Site Investigation (DSI) in order to characterise the nature, extent and risk of potential contamination onsite (site derived and offsite migration).

It was recommended that waste material identified on site, derived from the illegal dumping/fly tipping activity is removed and disposed of off-site appropriately at the time of demolition, prior to the completion of further investigative activities.

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5. Preliminary Conceptual Site Model

A preliminary conceptual site model (CSM) was developed as part of JBS&G (2023) presented herein. The CSM will be further refined following the additional investigations proposed as part of this SAQP during development of the DSI.

For a potential contamination risk to be present at a site, a complete exposure pathway must exist which consists of:

- Areas of potential environmental concern (e.g., primary sources such as leaking chemical tanks; secondary sources such as impacted soils/groundwater/surface water).
- A transport mechanism (pathway) between the source and the receptor (e.g., direct dermal contact with soil/dust/water, inhalation of vapours, migration of groundwater through aquifer matrix).
- An exposure point where a receptor comes into contact with the contamination.
- An exposure route (i.e., inhalation, ingestion or dermal).

5.1 Areas of Potential Environmental Concern

Based on the information obtained in the desktop assessment and site inspection the following APEC were identified:

1. Former site structures and stockpiled soils
2. Illegal dumping/fly tipping activities.
3. Potential uncontrolled fill.
4. Historical land uses of the site.
5. Migration of potentially contaminated groundwater beneath the site from up-gradient properties.

5.2 Potential Receptors

On Site

- Current and future excavation/maintenance workers potentially exposed to impacted soils and groundwater during trenching works, dewatering works or remedial works.
- Future on-site residents
- Terrestrial ecology.
- Surface water at the site
- Groundwater beneath the site.

Off Site

The following potential off-site receptors have been identified in the event that site derived contamination is migrating off site.

- Current and future excavation/maintenance workers potentially exposed to impacted soils and/or groundwater during trenching works or remedial works completed adjacent to the site.
- Future off-site residents and site visitors.
- Terrestrial ecology

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- Surface water bodies

5.3 Potential Pathways

Potential contaminant exposure or migration pathways for the COPCs are summarised below.

- Infiltration of contaminants into the underlying soil and groundwater.
- Vapour migration from impacted soil or groundwater.
- Direct contact with impacted soils or groundwater.
- Windblown dusts and/or fibres.
- Groundwater migration and abstraction.

Potential exposure routes for human health include:

- Dermal contact.
- Ingestion.
- Inhalation.

Potential exposure routes for ecological receptors include:

- Direct contact.
- Uptake through roots.

5.4 Potential Pollutant Linkages

Table 5-1 provides a summary of updated potential pollutant linkages of the conceptual site model.

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Table 5-1: Conceptual Site Model

APEC	Receptor	Exposure Pathway	Linkage Status	Justification
1.Contamination associated with the former site structures and stockpiled soils. <u>COPC</u> • ACM • TRH • BTEX • PAH • VOC/SVOC •Metals	**Onsite -** future site visitors and residents.	Dermal contact and incidental ingestion of soil and/or groundwater.	Possible	Stockpiled soils were observed on Lot 1104 and off-site (north of Lot 11 and Lot 140 – not included in this investigation). The nature and extent of potential contamination within the stockpiled soil on Lot 1104 is currently unknown. Risks to onsite workers, visitors and residents via dermal contact of soil is possible. The leaching of potential contaminants associated with the stockpiled soils can possibly migrate to groundwater. Dermal contact of groundwater for site visitors and residents on-site will only be possible through groundwater abstraction. Dermal contact of groundwater for on-site site visitors and residents is considered highly unlikely as there are no current abstraction bores on-site. It is highly unlikely that a bore will be installed in the future due to the saline nature of the groundwater.
		Inhalation of dust and fibres	Possible	There is a possibility that wind can generate dust off the stockpiles and therefore mobilise the identified stockpiles COPC, creating unacceptable risks to future on-site workers, visitors and residents via dust inhalation. The preliminary site investigation identified PACM within Lot 1104, 1209, 895 and 1350. The presence of PACM fragments in these areas present a potentially unacceptable health risk to future residents, workers and site visitors, including an aesthetic risk. **Qualitative Risk Rating: Moderate**
	Onsite - intrusive maintenance and civil contractors	Dermal contact and incidental ingestion of soil and/or groundwater.	Possible	Stockpiled soils were observed on Lot 1104 and off-site (north of Lot 11 and Lot 140 – not included in this investigation). The nature and extent of potential contamination within the stockpiled soils is currently unknown. Risks to intrusive maintenance workers and civil contractors via dermal contact of stockpiled soil is possible. The leaching of potential contaminants associated with the stockpiled soils can possibly migrate to groundwater. As groundwater at the site is shallow, intrusive maintenance workers and civil contractors may encounter potentially contaminated groundwater.
		Inhalation of dust and fibres	Possible	There is a possibility that future civil works generate dust and therefore mobilise the identified stockpiles COPC, creating unacceptable risks to intrusive maintenance and civil contractors via dust inhalation. The preliminary site investigation identified PACM within Lot 1104, 1209, 895 and 1350. Excavation activities (particularly during development) could result in significant disturbance of PACM and potential for generation of fibres if not appropriately managed. **Qualitative Risk Rating: Moderate**

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APEC	Receptor	Exposure Pathway	Linkage Status	Justification
	Onsite – Ecological Receptors	Uptake by roots	Possible	Vegetated areas for the current (general industry and rural residential) and future (mixed use) land uses are considered to be low ecological significance. No signs of vegetation stress were observed during the preliminary site investigation. **Qualitative Risk Rating: Low**
	Offsite - human receptors including recreational users of the Royal Princess Harbour	Dermal contact and incidental ingestion of groundwater.	Unlikely	Stockpiled soils were observed on Lot 1104 and off-site (north of Lot 11 and Lot 140 – not included in this investigation). The nature and extent of potential contamination within the stockpiled soils is currently unknown. There is a possibility (unlikely) that potentially impacted soils may leach into groundwater and then migrate off-site where recreational users of the marine environment may be exposed via dermal contact and incidental ingestion. The closest groundwater abstraction bore is 1.2 km cross-gradient (west) of the site, it is therefore considered that potential contaminants from the site present in groundwater (if present) will not impact the human receptors abstracting water from the bore.
		Inhalation of dust and fibres	Possible	There is a possibility that future civil works and wind generate dust and therefore mobilise the identified stockpiles COPC, creating unacceptable risks to off-site human receptors via dust inhalation. The preliminary site investigation identified PACM within Lot 1104, 1209, 895 and 1350. Development activities would result in significant disturbance of soils and possible generation of fibres which may impact offsite receptors if not appropriately managed. **Qualitative Risk Rating: Low**
	Offsite - Ecological Receptors	Direct Contact	Unlikely	The Royal Princess Harbour is the closest down-gradient ecological receptor to the site. The Royal Princess Harbour is located along the southern boundary of the site. Leaching of contaminants within the stockpiled material to groundwater and subsequent off-site migration is possible, although unlikely, and could pose risks to the sensitive ecological receptors (if reported above ecological criteria) within the Harbour. **Qualitative Risk Rating: Low**
2. Illegal dumping/ Fly tipping activities COPC • ACM • TRH • BTEX	**Onsite -** future site visitors and residents.	Dermal contact and incidental ingestion of soil and/or groundwater.	Possible	During the site inspection, fly tipping was observed in areas of cleared land, primarily located in the eastern portion of the site. The nature and extent of this fly tipping is currently unknown but is comprised mainly of steel structures, metal sheeting and wire, concrete, rubble, concrete pipes etc. It is possible that fly tipping may have resulted in contamination to the underlying soils. If disturbance works are completed on the material, there is possibility for residents, on-site workers and visitors to be exposed to contaminants. Fly tipping also represents an aesthetic risk. Potential groundwater impacts through leaching are unknown but are considered unlikely.

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APEC	Receptor	Exposure Pathway	Linkage Status	Justification
• PAH • VOC/sVOC •Metals		Inhalation of impacted dusts/fibres	Possible	PACM along with other COPCs were observed in association with the fly tipping observed on-site. It is possible that fly tipping may have resulted in contamination to the underlying soils. Therefore, future civil works that generate dust and therefore mobilise the identified COPC, can creating unacceptable risks on-site future workers, site visitors and residents via dust and fibre inhalation. **Qualitative Risk Rating: Low**
	Onsite - intrusive maintenance and civil contractors	Inhalation of impacted dusts/fibres. Dermal contact and incidental ingestion of soil and/or groundwater.	Possible Possible	During the site inspection, fly tipping was observed in areas of cleared land, primarily located in the eastern portion of the site. The nature and extent of this fly tipping is currently unknown but is comprised mainly of steel structures, metal sheeting and wire, concrete, rubble, concrete pipes etc. If disturbance works are completed on the material, there is possibility for contaminants and PACM to be exposed to onsite intrusive maintenance workers. The current nature and extent of contaminants associated with fly tipping is currently unknown, although, potential groundwater impacts through leaching that pose risks to future onsite intrusive maintenance and civil contractors are considered low (groundwater assumed to be less than 2 m bgl). **Qualitative Risk Rating: Low**
	Onsite – Ecological Receptors	Uptake by roots	Unlikely	Vegetated areas for the current (general industry and rural residential) and future (mixed use) land uses are considered to be low ecological significance. No signs of vegetation stress were observed during the preliminary site investigation. **Qualitative Risk Rating: Low**
	Offsite - Current and future off-site workers and residents	Inhalation of impacted dusts/fibres Dermal contact and incidental ingestion groundwater.	Possible Unlikely	During the site inspection, fly tipping was observed in areas of cleared land, primarily located in the eastern portion of the site. The nature and extent of this fly tipping is currently unknown but is comprised mainly of steel structures, metal sheeting and wire, concrete, rubble, concrete pipes etc. On-site civil works and wind can mobilise contaminants and PACM associated with fly tipping, it is possible for contaminants to pose a risk to off-site site workers and residents. The current nature and extent of contaminants associated with fly tipping is unknown, therefore, potential groundwater impacts through leaching are unknown. Dermal contact and incidental ingestion of potentially contaminated groundwater for future off-site workers and residents is considered unlikely as there are no down gradient off-site residents or site workers. The closest groundwater abstraction bore is 1.2 km cross-gradient (west) of the site, it is therefore considered that potential contaminants from the site present in groundwater will not impact the human receptors abstracting water from the bore.

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APEC	Receptor	Exposure Pathway	Linkage Status	Justification
				Qualitative Risk Rating: Low
	Offsite – recreational users of the Royal Princess Harbour	Inhalation of impacted dusts/fibres	Possible	During the site inspection, fly tipping was observed in areas of cleared land, primarily located in the eastern portion of the site. The nature and extent of this fly tipping is currently unknown but is comprised mainly of steel structures, metal sheeting and wire, concrete, rubble, concrete pipes etc. On-site civil works and wind can mobilise contaminants and PACM associated with fly tipping, it is possible for contaminants to pose a risk to off-site recreational users of the Royal Princess Harbour.
		Dermal contact and incidental ingestion of groundwater.	Unlikely	Potential contaminants associated with onsite fly tipping are unknown. Contaminated groundwater on-site associated with the leaching of COPC from fly tipping could migrate off-site and be expressed as surface water in Princess Harbour. Ingestion of this contaminated groundwater by recreational users (now expressed as surface water) is unlikely. **Qualitative Risk Rating: Low**
	Offsite – Ecological Receptors	Direct Contact	Unlikely	The Royal Princess Harbour is the closest down-gradient ecological receptor to the site. The Royal Princess Harbour is located along the southern boundary of the site. Leaching of contaminants within the fly tipping material to groundwater and subsequent off-site migration is possible, although unlikely, and could pose risks to the sensitive ecological receptors (if reported above ecological criteria) within the Harbour. **Qualitative Risk Rating: Low**
3.Potential uncontrolled fill <u>COPC</u> • Asbestos • TRH • BTEX • PAH • VOC/sVOC •Metals	**Onsite -** future site visitors and residents.	Dermal contact and incidental ingestion of soil and/or groundwater.	Possible	Review of historical aerial imagery at the site identified the potential for uncontrolled fill placement prior to, and during, development of the Woolstores site. During the site inspection it was noted that the site was generally flat, and slopes to the south towards Princess Royal Harbour. The Woolstores warehouses have been built on top of the reclaimed land. The imported material was observed to contain PACM along with other rubble. At the time of inspection, the off-site northern rural residential properties had been cleared of most vegetation and site structures (residential houses). A limestone road base was imported to assist with site levels. The origin of this limestone road base is from the Great Southern Region Quarry Pits. The quarry certificates are presented in Appendix G and does not pose any risks to receptors. The areas that have been subject to imported fill (the material under the Woolstores warehouses) could potentially pose risks via direct contact, dust and fibre inhalation, although the nature and extent of contamination is currently unknown. As the nature and extent of contaminants associated with the potential uncontrolled fill is currently unknown, potential groundwater impacts through leaching are possible. Dermal contact
		Inhalation of impacted dusts/fibres	Possible	

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APEC	Receptor	Exposure Pathway	Linkage Status	Justification
				of groundwater for site visitors and residents on-site will only be possible through groundwater abstraction. Dermal contact of groundwater for on-site site visitors and residents is considered highly unlikely as there are no current abstraction bores on-site. It is also highly unlikely that a bore will be installed in the future due to the saline nature of the groundwater. **Qualitative Risk Rating: Low/Moderate**
	Onsite - intrusive maintenance and civil contractors	Inhalation of impacted dusts/fibres. Dermal contact and incidental ingestion of soil and/or groundwater.	Possible Possible	Review of historical aerial imagery at the site identified the potential for uncontrolled fill placement prior to, and during, development of the site. During the site inspection it was noted that the site was generally flat, and slopes to the south towards Princess Royal Harbour. The Woolstores warehouses have been built on top of the reclaimed land. The imported material was observed to contain PACM along with other rubble. At the time of inspection, the off-site northern rural residential properties had been cleared of most vegetation and site structures (residential houses). A limestone road base was imported to assist with site levels. The origin of this limestone road base is from the Great Southern Region Quarry Pits. The quarry certificates are presented in Appendix G and does not pose any risks to receptors. The areas that have been subject to imported fill (the material under the warehouses) could potentially pose risks via direct contact and fibre inhalation, when civil works begin or general intrusive maintenance works. The current nature and extent of contaminants associated with the imported fill is currently unknown, therefore, potential groundwater impacts through leaching of the potentially contaminated soil are unknown but could pose risks to future onsite intrusive maintenance and civil contractors (groundwater assumed to be less than 2 m bgl). **Qualitative Risk Rating: Low/Moderate**
	Onsite – Ecological Receptors	Uptake by roots	Possible	Vegetated areas for the current (general industry and rural residential) and future (mixed use) land uses are considered to be low ecological significance. No signs of vegetation stress were observed during the preliminary site investigation. **Qualitative Risk Rating: Low**
	Offsite - Current and future off-site workers and residents	Inhalation of impacted dusts/fibres Dermal contact and incidental ingestion of groundwater.	Possible Unlikely	It is possible for dust to be generated during future excavation and earthworks of material on-site. PACM was observed within the fill material present on the Woolstores lots. There are surrounding residential and industrial properties that may be at risk from impacted dusts/ fibres once airborne. a potential pathway link via leaching of contaminants within the fill to offsite receptors. As groundwater flow direction is to the south (Princess Harbour), the likelihood of exposure to off-site site workers and residents is unlikely Potential contaminants present

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APEC	Receptor	Exposure Pathway	Linkage Status	Justification
				in the fill material on site are unknown. Groundwater is present between roughly 0 – 2 m bgl and is therefore. **Qualitative Risk Rating: Low**
	Offsite – recreational users of the Royal Princess Harbour	Inhalation of impacted dusts/fibres Dermal contact and incidental ingestion of groundwater.	Possible Unlikely	On-site civil works and wind can mobilise contaminants and PACM associated with fly tipping, it is possible for contaminants to pose a risk to off-site recreational users of the Royal Princess Harbour. Contaminated groundwater on-site associated with the leaching of COPC from the imported fill could migrate off-site and be discharged to surface water in Princess Harbour. Contact with contaminated groundwater by recreational users is unlikely. **Qualitative Risk Rating: Moderate**
	Offsite – Ecological Receptors	Direct Contact	Possible	The Royal Princess Harbour is the closest down-gradient ecological receptor to the site. The Royal Princess Harbour is located along the southern boundary of the site. Leaching of contaminants within the fly tipping material to groundwater and subsequent off-site migration is possible, although unlikely, and could pose risks to the sensitive ecological receptors (if reported above ecological criteria) within the Harbour. **Qualitative Risk Rating: Moderate**
4. Historical land uses of the site. <u>COPC</u> • TRH • BTEX • PAH • VOC/sVOC • OCP/OPP •Metals •Asbestos	**Onsite** - Current and site visitors and residents.	Dermal contact and incidental ingestion of soil and/or groundwater.	Possible	The historical operation of the Woolstores lots as industrial since the 1950s and rural residential land uses in the remaining lots has the potential to cause contamination. Historical aerials suggest that the site has been predominantly unsealed including at the time of this investigation. Potential hydrocarbons, pesticides and heavy metals could be present through the unsealed soil profile and groundwater onsite. The on-site drain network present on the Woolstores lots could act as a potential pathway for contaminated soils to leach into groundwater on-site. The northern rural residential lots, although currently undeveloped, have the potential to be a source of contamination. No visual or olfactory contamination was observed at the rural residential lots at the time of inspection, although, this does not discount the possibility of contamination being present. As the nature and extent of contaminants associated with the historical land uses is currently unknown, potential groundwater impacts through leaching are possible. Dermal contact of groundwater for site visitors and residents on-site will only be possible through groundwater abstraction. Dermal contact of groundwater for on-site site visitors and residents is considered highly unlikely as there are no current abstraction bores on-site. It is also highly unlikely that a bore will be installed in the future due to the saline nature of the groundwater.

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APEC	Receptor	Exposure Pathway	Linkage Status	Justification
		Inhalation of vapours	Unlikely	Potential hydrocarbon contamination in the soil profile can also migrate via leaching into groundwater and may represent a risk to human receptors via vapour inhalation. Although, no hydrocarbon staining or contamination was observed, therefore, the risk of this is considered low.
		Inhalation of fibres	Possible	Historical building structures (PACM roofing panels) were observed during the site inspection, although were in the process of being removed. There is still a possibility that fugitive PACM fragments will exist in the surrounding soil once the roofing panels have been removed. **Qualitative Risk Rating: Low**
	Onsite - intrusive maintenance and civil contractors	Dermal contact and incidental ingestion of soil and/or groundwater.	Possible	The historical operation of the Woolstores lots as industrial since the 1950s and rural residential land uses in the remaining lots has the potential to cause contamination. Historical aerials suggest that the site has been predominantly unsealed including at the time of this investigation. Potential hydrocarbons, pesticides and heavy metals could be present through the unsealed soil profile and groundwater onsite. The on-site drain network present on the Woolstores lots could act as a potential pathway for contaminated soils to leach into groundwater on-site. No visual or olfactory contamination was observed at the rural residential lots at the time of inspection, although, this does not discount the possibility of contamination being present. As the nature and extent of contaminants associated with the historical land uses is currently unknown, potential groundwater impacts through leaching are possible and pose risks to intrusive maintenance workers and civil contractors (groundwater assumed to be less than 2 m bgl).
		Inhalation of vapours	Possible	
		Inhalation of fibres	Possible	Based on the depth to groundwater, intrusive workers could potentially come into contact with groundwater at the site. The current nature and extent of contaminants associated with the historical industrial land use is currently unknown, therefore, potential groundwater impacts through leaching are unknown but could pose risks to future onsite intrusive maintenance and civil contractors (groundwater assumed to be less than 2 m bgl). If present, vapours have the potential to accumulate in trenches and excavations posing unacceptable risks to intrusive maintenance workers and civil contractors. Historical building structures (PACM roofing panels) were observed during the site inspection, although were in the process of being removed. There is still a possibility that fugitive PACM fragments will exist in the surrounding soil once the roofing panels have

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APEC	Receptor	Exposure Pathway	Linkage Status	Justification
				been removed. This PACM material (if present) will pose risks to onsite intrusive maintenance and civil contractors via fibre inhalation. **Qualitative Risk Rating: Low**
	Onsite – Ecological Receptors	Uptake by roots	Possible	Vegetated areas for the current (general industry and rural residential) and future (mixed use) land uses are considered to be low ecological significance. No signs of vegetation stress were observed during the preliminary site investigation. **Qualitative Risk Rating: Low**
	Offsite - human receptors including residents and recreational users of the Royal Princess Harbour	Dermal contact and incidental ingestion of groundwater. Inhalation of dust and fibres	Unlikely Possible	Potential contaminants associated with the historical industrial land use of the Woolstores lots are unknown. Potentially contaminated soils on-site could possibly leach into the shallow groundwater and migrate down gradient to the Princess Harbour and become expressed as surface water. Dermal contact and incidental ingestion of potentially contaminated groundwater (expressed as surface water) for recreational receptors in the Royal Princess Harbour is considered possible but unlikely. It is possible for contaminated dust and PACM fibres to be generated during future excavation, earthworks and wind. Surficial PACM was observed throughout the Woolstores lots. There are surrounding residential and industrial properties that may be at risk from impacted dusts/ fibres if airborne. Recreational users of the Royal Princess Harbour could potentially be at risk from fibres and dust generated from wind and during future excavation and earthworks of material onsite. **Qualitative Risk Rating: Low**
	Offsite - Ecological Receptors	Direct Contact	Possible	The Royal Princess Harbour is the closest down-gradient ecological receptor to the site. The Royal Princess Harbour is located along the southern boundary of the site. Leaching of contaminants within the soil to groundwater and subsequent off-site migration is possible, although unlikely, and could pose risks to the sensitive ecological receptors (if reported above ecological criteria) within the Harbour. **Qualitative Risk Rating: Low**
5. Migration of contaminated groundwater from up-gradient properties COPC	**Onsite** - Current and future on-site workers, site visitors and residents.	Dermal contact and incidental ingestion of groundwater.	Possible	There are various properties to the north of the site that have been classified as Remediated for Restricted Use (commercial/ industrial). Groundwater from these up-gradient properties have reported acidic conditions and contain elevated concentrations of metals (aluminium, iron, copper and zinc). The acidic groundwater conditions are thought to be representative of regional conditions, although, elevated concentrations of metals are associated with the contaminating activities from the up-gradient classified sites. There is no evidence to confirm that these impacts have migrated off-site (creating

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APEC	Receptor	Exposure Pathway	Linkage Status	Justification
• pH •Metals				a 'source site'). If these impacts were to migrate off-site and come on-site, dermal contact and ingestion of water would only be possible through groundwater abstraction. Dermal contact of groundwater for on-site site visitors and residents is considered highly unlikely as there are no current abstraction bores on-site. It is also highly unlikely that a bore will be installed in the future due to the saline nature of the groundwater. **Qualitative Risk Rating: Low**
	Onsite intrusive maintenance and civil contractors	Dermal contact and incidental ingestion of groundwater.	Possible	There are various properties to the north of the site that have been classified as Remediated for Restricted Use (commercial/ industrial). Groundwater from these up-gradient properties have reported acidic conditions and contain elevated concentrations of metals (aluminium, iron, copper and zinc). However, a review of groundwater data from across the catchment area indicates that the levels of nutrients, acidity, and metals in groundwater beneath this site are indicative of background up-hydraulic gradient groundwater quality. There is no evidence to confirm that these impacts have migrated off-site (creating a 'source site'). Groundwater on-site could potentially be intersected by regular maintenance activities and therefore may present unacceptable risks for intrusive maintenance workers. **Qualitative Risk Rating: Moderate**
	Onsite – Ecological Receptors	Uptake by roots	Possible	Vegetated areas for the current (general industry and rural residential) and future (mixed use) land uses are considered to be low ecological significance. No signs of vegetation stress were observed during the preliminary site investigation. **Qualitative Risk Rating: Low**

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6. Community Consultation

NEPM Schedule B8 provides guidelines for community engagement and risk communication strategies on contaminated site projects. Table 6-1 below, provides a community involvement framework that has been considered to help guide the selection of the appropriate level of consultation.

Table 6-1: Selecting the Level of Community Involvement

Assessment Questions	V. Low	Low	Med	High	V. High
Perceptions of persons external to the proposal (the community)					
What is the level of existing controversy surrounding this type of facility?		✓			
How significant are the potential impacts to the community?		✓			
What is the level of significance of this issue to the major stakeholders?	✓				
What level of involvement does the community appear to desire?	✓				
What level of involvement do key stakeholders appear to desire?	✓				
What is the probable level of difficulty in solving the issue?		✓			
What is the required level of public input?	✓				
What is the potential for the number of actively involved stakeholders to balloon?	✓				
To what degree does the public appear to want to be involved?	✓				
What is the potential for the public to influence the potential outcome?	✓				
How significant are the possible benefits of involving the public?	✓				
How serious are the ramifications of not involving the public?	✓				
What is the possibility that the media will become interested?	✓				
What is the likelihood that decision-makers will give full consideration to public input?	✓				
What is the likelihood that adequate resources will be made available to support community involvement?	✓				
What is the likely level of political controversy on this issue?	✓				

As no offsite activities are anticipated at this point in time, it is assessed that the level of community consultation required is currently low and community consultation activities are not required at this stage of the investigation. The requirement for community consultation will need reassessment depending on the outcome of this investigation.

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7. Data Quality Objectives

7.1 Data Quality Objectives

Data quality objectives (DQOs) consistent with the NEPM DQO process, as outlined in Schedule B2: Guideline on Site Characterisation (NEPM, 2013) were developed for the contamination assessment, as discussed in the following sections.

7.1.1 State the Problem

The PSI completed for the site has identified a number of APEC which require further investigation. Intrusive sampling is required in order to characterise the contamination status of the site to enable an assessment of potential risk to human health and/or the environment to be made and to confirm suitability for future proposed land uses, which include commercial activities, residential land use (varying densities) and public open space.

Additionally, the PSI identified that the site is classed as having a 'High Probability of Occurrence' (ASRIS 2013) and/or 'High to Moderate risk' (DWER 2017) of ASS occurring within 3 m of the natural soil surface that could be disturbed by most land development activities. The DWER (2015) guidance states that in areas of 'High to Moderate risk' of ASS occurring, an ASS investigation is required prior to the following ground disturbance events:

- Earthworks that will disturb more than 100 m^3 of soil.
- During dewatering or soil draining activity.

7.1.2 Identify the Decision

The specific decisions required to be made as part of investigation of the identified APECs are summarised below.

- Are there any unacceptable risks from soil and groundwater contamination that are likely to impact current or future on-site and off-site receptors?
- Are there any aesthetic issues at the site such as odorous soils or groundwater?
- Is remediation and/or management of APECs required to facilitate future development of the site?
- Is ASS present which will require management during future development activities?

7.1.3 Identify Inputs to the Decision

Inputs to the decisions will be:

- Environmental data to be collected by sampling and analysis, and additional site observations made during the investigation.
- The advancement of soil bores and collection of soil samples.
- The installation of groundwater monitoring wells.
- The collection of groundwater samples from newly installed groundwater monitoring wells.
- Analytical methods for COPCs are selected so that assessment can be made relative to applicable site criteria.
- Confirmation that data generated by sampling and analysis are of an acceptable quality as undertaken by assessment of quality assurance / quality control as per the data quality indicators (DQIs).

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- Identification of potential receptors and exposure pathways with consideration of potential exposure periods in relation to identified COPCs.

7.1.4 Define the Study Boundaries

The lateral extent of the study will comprise the full extent of the site boundary, presented on **Figure 1** attached, with no intrusive investigation proposed outside of the site boundary. The vertical extent of the investigation will be approximately 6m bgl for soil for the ASS investigation, 2 m bgl for the asbestos and other COPC investigation and 9.5 m bgl for groundwater investigation, which is approximately 2 m below the maximum anticipated depth of groundwater at the site.

7.1.5 Develop a Decision Rule

Analytical data will be assessed against criteria appropriate for the proposed land uses, including commercial, public open space and residential.

The decision rules adopted to address the identified problem are summarised in Table 7-1**.**

Table 7-1: Summary of Decision Rules

Decision Required to be Made	Decision Rule
Are there any unacceptable risks to on-site and potential off-site future receptors from sampled media?	Soil and groundwater analytical data will be compared against relevant adopted site assessment criteria. The Tier 1 qualitative risk assessment will identify whether concentrations of COPCs reported from environmental media potentially pose an unacceptable risk to the identified receptors where potentially complete source-pathway-receptor (SPR) linkages have been identified. If the analytical data exceeds the adopted assessment criteria the decision will be Yes. Statistical analysis may be considered to assess the data set if the answer to the decisions is Yes. If the analytical data is below the adopted assessment criteria, the answer to the decision will be No.
Are there any aesthetic issues at the site?	If there are any unacceptable odours, soil discoloration or visual considerations (such as the presence of rubbish or rubble), the answer to the decision is Yes. Otherwise, the answer to the decision is No.
Is remediation and/or management of APECs required to facilitate future development of the site?	Should any unacceptable risks to on-site or potential off-site receptors remain, the answer to the decision will be Yes. Otherwise, the answer to the decision is No.
Are the results of acid sulfate soil field indicators indicative of ASS, as per Table 5 of DWER 2015?	ASS field data will be compared against DWER 2015 indicators for ASS. If the reported field results do not meet the criteria presented in Table 5 as indicative of ASS, then the answer will be No. If the criteria are not satisfied, the decision will be Yes. Where the answer is Yes, laboratory analysis is required as per below.
Are the results of laboratory testing for ASS on selected samples above the relevant net acidity action criteria?	Soil analytical data will be compared against DWER 2015 net acidity action criteria. The reported concentrations are all below the site criteria; If the criteria stated above is satisfied, the decision will be No. If the criteria are not satisfied, the decision will be Yes.

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7.1.6 Specify Limits of Decision Error

This step is to establish the decision maker's tolerable limits on decision errors, which are used to establish performance goals for limiting uncertainty in the data. Data generated during this project must be appropriate to allow decisions to be made with confidence.

Specific limits for this project have been adopted in accordance with the appropriate guidance from the NEPM (NEPC 2013), appropriate data quality indicators (DQIs used to assess QA/QC) and standard JBS&G procedures for field sampling and handling.

To assess the usability of the data prior to making decisions, the data will be assessed against pre-determined Data Quality Indicators (DQIs) established for the project are discussed below in relation to precision, accuracy, representativeness, comparability, completeness and sensitivity (PARCCS parameters), and are detailed in Table 7-2**.**

- **Precision** - measures the reproducibility of measurements under a given set of conditions. The precision of the laboratory data and sampling techniques is assessed by calculating the Relative Percent Difference (RPD) of duplicate samples.
- **Accuracy** - measures the bias in a measurement system. The accuracy of the laboratory data that are generated during this study is a measure of the closeness of the analytical results obtained by a method to the 'true' value. Accuracy is assessed by reference to the analytical results of laboratory control samples, laboratory spikes and analyses against reference standards.
- **Representativeness** –expresses the degree which sample data accurately and precisely represent a characteristic of a population or an environmental condition. Representativeness is achieved by collecting samples on a representative basis across the site, and by using an adequate number of sample locations to characterise the site to the required accuracy.
- **Comparability** - expresses the confidence with which one data set can be compared with another. This is achieved through maintaining a level of consistency in techniques used to collect samples; ensuring analysing laboratories use consistent analysis techniques and reporting methods.
- **Completeness** – is defined as the percentage of measurements made which are judged to be valid measurements. The completeness goal is set at there being sufficient valid data generated during the study.
- **Sensitivity** – expresses the appropriateness of the chosen laboratory methods, including the limits of reporting, in producing reliable data in relation to the adopted criteria.

If any of the DQIs are not met, further assessment will be necessary to determine whether the non-conformance will significantly affect the usefulness of the data. Corrective actions may include requesting further information from samplers and/or analytical laboratories, downgrading of the quality of the data or alternatively, re-collection of the data.

Table 7-2: Summary of Quality Assurance/Quality Control Program

Data Quality Objectives	Frequency	Data Quality Indicator
Precision		
Blind duplicates (intra laboratory)	1 / 20 samples	<30% RPD for concentrations greater than 10 times the LOR. <100% RPD where concentrations are less than 10 times the LOR.
Blind triplicates (inter laboratory)	1 / 20 samples	<30% RPD for concentrations greater than 10 times the LOR. <100% RPD where concentrations are less than 10 times the LOR.

Data Quality Objectives	Frequency	Data Quality Indicator
Laboratory Duplicates	1 / 20 samples	<50% RPD
Accuracy		
Surrogate spikes	All organic samples	70-130%
Laboratory control samples	1 per lab batch	70-130%
Matrix spikes	1 per lab batch	70-130%
Representativeness		
Sampling appropriate for media and analytes	-	-
Samples extracted and analysed within holding times.	-	As per laboratory's NATA accreditation
Rinsate	1 per day where reusable equipment is used	<LOR
Laboratory (method) Blanks	1 per analytical method	<LOR
Comparability		
Standard operating procedures for sample collection & handling	All samples	All samples
Standard analytical methods used for all analyses	All samples	All samples
Consistent field conditions, sampling staff and laboratory analysis	All samples	All samples
Limits of reporting appropriate and consistent	All samples	All samples
Completeness		
Sample description and COCs completed and appropriate	All samples	All samples
Appropriate documentation	All samples	All samples
Satisfactory frequency and result for QC samples	All QA/QC samples	-
Data from critical samples is considered valid	-	Critical samples valid
Sensitivity		
Field and analytical methods and limits of recovery appropriate for media and adopted site assessment criteria	All samples	LOR < adopted site criteria (where possible)

If any of the DQIs are not met, further assessment will be necessary to determine whether the non-conformance will significantly affect the usefulness of the data. Corrective actions may include requesting further information from samplers and/or analytical laboratories, downgrading of the quality of the data or alternatively, re-collection of the data.

A qualitative assessment of compliance with standard procures and appropriate sample collection methods will be completed during the DQI compliance assessment.

7.1.7 Optimise the Design for Obtaining Data

The sampling design for the investigation of the areas of concern is based on the current understanding of the site's CSM, including review of historical information.

Optimisation for the investigation of each APEC has been discussed in the relevant methodology sections (**Section 8**). Generally, a targeted sampling approach has been adopted to facilitate lateral and vertical delineation of identified APECs.

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8. Methodology

8.1 Proposed Investigation Locations and Rationale

A sampling plan has been developed, reflecting the findings of the PSI, and is presented herein.

The works will be completed in general conformance with WA DWER Contaminated Sites Guidelines (2021), the National Environment Protection (Assessment of Site Contamination) Measure 1999, (NEPC 2013), and with respect to relevant Australian Standards (AS4482.1, AS4482.2, 5667.1, 5667.11, etc.).

Based on JBS&G's experience with similar projects it is envisaged that this site will follow a staged process whereby the following stages will be required in order to achieve DWER reclassification:

Sampling and Analysis Quality Plan (SAQP) → Detailed Site Investigation (DSI) → Remediation Action Plan (RAP) → Site Remediation and Validation (SRV) → Site Management Plan (SMP) (if required).

8.1.1 Asbestos Investigation

Commercial/ Industrial Lots

Although not identified as a specific APEC, asbestos was identified as a relevant COPC for all APEC defined in the PSI. However, the potential for asbestos to be present is different in different areas of the site, resulting in different investigative requirements. Contamination is likely to be in the form of bonded ACM rather than fibrous asbestos (FA) or asbestos fines (AF).

Commercial/ industrial site structures which have recently been demolished are known to have included asbestos containing materials (ACM) However, there is considered a low potential for demolition to have resulted in the contamination of soils at the site with asbestos based on the controlled manner in which asbestos removal and subsequent demolition occurred. It is also possible that asbestos may be present in underground structures at the site, including pipes, infrastructure conduits, footings, and slabs which have not yet been identified. In the absence of any evidence of the existence of such structures, it is suggested that if they are identified in the future (during development activities), they are managed as unexpected finds.

Imported Fill Material, Fly Tipping/ Illegal Dumping, Observed PACM Fragments

There is an area in the eastern portion of the site where fill material is observed to have been placed. Multiple PACM fragments were also observed across this area, and it is considered likely that these are (at least in part) associated with the inappropriate demolition of a historical building in the area. Numerous instances of fly tipping/ illegal dumping, including building wastes, were also observed in this area of the site. The relevant area is depicted in **Figure 2**. Based on the above, in accordance with Table 4 of DoH 2021, the likelihood of asbestos is considered 'likely', and double density sampling in this area is warranted. Based on an area of ~1.5 ha, this would equate to 50 test pit locations. Investigation will be required to extend to below the depth of imported fill materials where virgin/natural soils are present, which is anticipated to be 1.5 m bgl to 2 m bgl. Proposed test pit locations are presented in **Figure 3.**

Reclaimed Land

A review of historical aerial photographs has identified that the southern portion of the site is reclaimed land. The fill utilised to create the current site levels is of unknown origin. The relevant area is depicted in **Figure 2**. Based on the presence of uncontrolled fill, in conjunction with the description in the PSI of stockpiled soil being present throughout the site observed to contain building wastes, in accordance with Table 4 of DoH 2021, the likelihood of asbestos is considered 'suspect', and single density sampling is considered to be appropriate. Based on an area of ~3.7 ha, this would equate to 45 test pit locations. Investigation will be required to extend to below the depth of imported fill materials where virgin/natural soils are present, which is anticipated to be 1.5 m bgl to 2 m bgl. Proposed test pit locations are presented in **Figure 3.**

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Balance of Commercial/ Industrial Lots

The site has a long commercial/ industrial history and the presence of structures containing ACM is known. Additionally, the PSI described stockpiled soil being present throughout the commercial/ industrial lots observed to contain building wastes. It is also possible that areas of fill placement encroach on this portion of the lots. The relevant area is depicted in **Figure 2**. Based on the above, in accordance with Table 4 of DoH 2021, the likelihood of asbestos is considered 'suspect', and single density sampling is considered to be appropriate. Based on an area of ~4.5 ha, this would equate to 52 test pit locations. Investigation will be required to extend to below the depth of imported fill materials where virgin/natural soils are present, which is anticipated to be a maximum 1.5 m bgl to 2 m bgl (likely less in this area of the site). Proposed test pit locations are presented in **Figure 3.**

Northern Rural Residential Lots

The potential for asbestos to be present within the northern rural lots is more limited based on their less disturbed nature. Areas of historical infrastructure associated with the rural residential land use visible in the historical aerial photographs appear to be limited to areas associated with Main Roads earthworks, outside the current site boundary, with the areas within the site boundary appearing to have been used for possible grazing purposes only. As there was no evidence of PACM identified during the site inspection, and no known significant infrastructure within these lots, it is not considered that sampling for asbestos is warranted in this area.

8.1.2 Former Site Structures and Stockpiled Soil

Commercial/ Industrial Lots

It is understood that at the time of DSI implementation, all stockpiled materials and site structures will have been removed from site as part of decommissioning and demolition activities. Potential contamination associated with former site structures and stockpiled soil will be addressed by the site-wide asbestos investigation described at Section 8.1.1, and the investigations relating to uncontrolled fill at Section 8.1.4 and historical land use described at Section 8.1.5 will address other COPC associated with former site structures and former stockpiled materials.

Northern Rural Residential Lots

Areas of historical infrastructure associated with the rural residential land use visible in the historical aerial photographs appear to be limited to areas associated with Main Roads earthworks, outside the current site boundary, with the areas within the site boundary appearing to have been used for possible grazing purposes only. No stockpiling was identified as having occurred in this area. As such, no specific sampling is proposed in the northern rural residential lots associated with former site structures.

8.1.3 Illegal Dumping/ Fly Tipping

Commercial/ Industrial Lots

Along the eastern portion of the Woolstores lots, illegal dumping/ fly tipping was observed. Fragments of PACM were observed at multiple locations during the site inspection.

It is understood that at the time of DSI implementation, these areas of fly tipping/ illegal dumping will have been removed from the site, as per the recommendations of the PSI. Regardless, contamination of soil may have occurred associated with the placement of these materials, which requires assessment.

50 test pits will be required in this area of the site to support the asbestos investigation detailed at Section 8.1.1. It is proposed that samples to assess potential contamination from illegal dumping/ fly tipping be collected from 25 of these test pits (selected based on field observations), which will be extended to the depth of virgin/ natural material (likely to be 1.5 m bgl to 2 m bgl), from a different wall of the excavation to the asbestos sampling. Given the occurrence of various instances of illegal dumping/ fly tipping, the requirement

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for 25 test pits is based on AS4482.1-2005 recommendation for 25 sampling points for an area of 1.5 ha for hot spot identification.

Due to the diverse range of COPC which could be associated with illegal dumping/ fly tipping, a broad suite of COPC is proposed, including:

- Total Recoverable Hydrocarbons (TRH).
- Benzene, Toluene, Ethylbenzene, Xylenes and Naphthalene (BTEXN).
- Polycyclic Aromatic Hydrocarbons (PAH).
- Volatile Organic Compounds (VOC)/ Semi Volatile Organic Compounds (SVOC).
- Metals
- Organochlorine Pesticides (OCP)/Organophosphorous Pesticides (OPP).

Northern Rural Residential Lots

No evidence of illegal dumping or fly tipping was observed in the northern rural residential lots, and therefore no investigations associated with this activity are proposed in the area.

8.1.4 Potential Uncontrolled Fill/ Reclaimed Land

Commercial/ Industrial Lots

The Woolstores site has been built on reclaimed land. Suspected imported fill material was also observed along the eastern boundary of the commercial/ industrial lots; however, the eastern area is addressed in Section 8.1.3 in conjunction with the fly tipping/ illegal dumping investigation.

45 test pits will be required in this area of the site to support the asbestos investigation detailed at Section 8.1.1. It is proposed that samples be collected to assess contamination from potential uncontrolled fill/ reclaimed land from 25 of these test pits, which will be extended to the depth of virgin/ natural material (likely to be 1.5 m bgl to 2 m bgl), from a different wall of the excavation to the asbestos sampling. 25 test pits are considered appropriate (representing approximately half the density recommended in AS4482.1-2005 for hot spot identification) given that a large proportion of the relevant area of land has been sealed with hardstand for the duration of the land use, limiting the potential for contamination.

Due to the diverse range of COPC which could be associated with uncontrolled fill, a broad suite of COPC is proposed, including:

- TRH.
- BTEXN.
- PAH.
- VOC/ SVOC.
- Metals
- OCP/ OPP.

Northern Rural Residential Lots

The potential for uncontrolled fill was not identified within the northern rural residential lots, and therefore investigations relating to that APEC are not proposed in this area.

8.1.5 Historical Land Uses

Commercial/ Industrial Lots

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The Woolstores site has been subject to commercial/ industrial land (including historical rail lines) uses for approximately 70 years. There is potential for contamination across the commercial/ industrial lots associated with these historical potentially contaminating activities to exist. The Woolstores site while operational was used as a wool storage facility with truck and machinery access. During the PSI, soak wells/ drains were observed but the linings were unable to be visually assessed.

52 test pits will be required in this area of the site to support the asbestos investigation detailed at Section 8.1.1. It is proposed that samples be collected to assess contamination from historical land uses from 26 of these test pits, which will be extended to the depth of virgin/ natural material (likely to be a maximum of 1.5 m bgl to 2 m bgl), from a different wall of the excavation to the asbestos sampling. 26 test pits are considered appropriate (representing approximately half the density recommended in AS4482.1-2005 for hot spot identification) given that a large proportion of the relevant area of land has been sealed with hardstand for the duration of the land use, limiting the potential for contamination.

In relation to the soak wells/ drains, it is recommended that this infrastructure is removed prior to environmental field works so that underlying and surrounding soils may be more easily assessed for contamination. Any sediment within these soak wells/ drains at the time of removal should be characterised by a qualified environmental consultant and disposed to an off-site appropriately licensed landfill. The test pits proposed for the asbestos investigation in the vicinity will be advanced to target the location of each soak well/ drain.

Due to the diverse range of COPC which could be associated with the various historical land uses, a broad suite of COPC is proposed, including:

- TRH.
- BTEXN.
- PAH.
- VOC/ SVOC.
- Metals
- OCP/ OPP.

Northern Rural Residential Lots

Areas of historical infrastructure associated with the rural residential land use visible in the historical aerial photographs appear to be limited to areas associated with Main Roads earthworks, outside the current site boundary, with the areas within the site boundary appearing to have been used for possible grazing purposes only. As such, no specific sampling is proposed in the northern rural residential lots associated with the historical grazing land use.

8.1.6 Groundwater Investigation

The PSI identified the potential for contaminated groundwater from up-gradient properties to migrate beneath the site. The potentially contaminating activities conducted at the site historically also have the potential to have resulted in groundwater contamination. A such, it is proposed to complete a groundwater investigation to assess the quality of groundwater beneath the site.

Given the site's proximity to the coast, groundwater levels range from approximately 7.5 metres below ground level (m bgl) to less than 1 m bgl. Groundwater flow direction beneath the site broadly flows southward, toward the coast.

The installation of six groundwater monitoring wells is proposed in the following locations (**Figure 5**):

- Within the central northern portion of the northern rural residential lots to assess groundwater conditions migrating onto the site from upgradient locations.

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- Within the central northern portion of the commercial/ industrial lots to assess groundwater conditions migrating onto the site from upgradient locations.
- In the approximate centre of the commercial/ industrial lots, in the vicinity of the former drains/ soak wells to assess potential impacts from this infrastructure, the former rail line, and the general commercial/ industrial land use.
- In the eastern portion of the site in the area of imported fill and the historical building.
- Two locations in the southern area of the site to assess quality of groundwater migrating off-site.

It is noted that groundwater well locations may need to be adjusted dependent on field observations during the field investigation (e.g. if areas of gross soil contamination are identified), and dependent on the findings of the proposed groundwater monitoring event, additional groundwater monitoring wells may require installation.

Groundwater samples will be analysed for a broad suite of COPC, to account for both on-site sources of contamination and off-site, up-gradient sources of contamination:

- TRH.
- BTEXN.
- PAH.
- VOC/ SVOC.
- Metals
- OCP/ OPP.
- Nutrients.
- pH.

8.1.7 Acid Sulfate Soils

The PSI identified that the site is within an area of 'High to Moderate risk' of ASS occurring. The DWER (2015) guidance states that in areas of 'High to Moderate risk' of ASS occurring, an ASS investigation is required prior to the following ground disturbance activities:

- Earthworks that will disturb more than 100 m^3 of soil.
- During dewatering or soil draining activity.

Given the proposed re-zoning and redevelopment of the site, it is likely that both the ground disturbance events above will occur. This will trigger the requirements for ASS investigation.

DER 2015 indicates that for non-linear disturbances at a site >4 ha, 2 sampling locations per hectare are required. ASS investigation will be required at both the northern rural residential lots, and the commercial/ industrial lots. Based on the size of each of these areas, the following number of sample locations are proposed:

- Northern rural residential lots (~6 ha) – 12 sampling locations.
- Commercial/ industrial lots (~10 ha) – 20 sampling locations.

Based on proposed conceptual level service plans provided by the client, the following was able to be ascertained regarding proposed ground disturbance at the site:

- An invert level of 0.92 m AHD will be required for a stormwater inlet headwall located along Woolstores Place where the current site levels are approximately 3 m AHD, indicating ground disturbance of approximately 2.1 m bgl will be required in this area.

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- An outlet headwall level of 4 m AHD was depicted on the eastern end of Woolstores Place, where an existing ground level of 5.75 m AHD is depicted, indicating disturbance of approximately 1.75 m bgl.
- The schematic sewer concept indicates an invert level of -1 m AHD in an area where current ground levels are approximately 3.3 m AHD, indicating a ground disturbance depth of approximately 4.3 m bgl.
- The schematic sewer concept indicates an invert level of 0.5 m AHD in an area where current ground levels are approximately 2.8 m AHD, indicating a ground disturbance depth of approximately 2.3 m bgl.

The maximum depth of disturbance identified based on the provided plans is 4.3 m bgl. The guidelines require that investigation is undertaken to at least 1 m in excess of the maximum depth of disturbance. Therefore, it is proposed that soil bores for the purposes of characterising ASS are advanced to 6 m bgl, as a conservative measure.

8.1.8 Summary of Sample Locations

A summary of proposed sample locations has been presented in Table 8-1 below.

Table 8-1: Summary of Sample Locations

Media	Area of Potential Concern	Number of Investigation Locations	Number of Samples to be Collected	Analytical Suite (no. of primary samples analysed)
Soil	Asbestos in soil (~10 ha)	147 test pits, 1 m x 1 m to a max. depth of 2 m bgl.	294[10]	NA
	Former site structures and stockpiled soil	No additional sampling for this APEC as it is captured under other APEC.	-	-
	Illegal dumping/ fly tipping (~1.5 ha)	25 of the above test pits will include sampling for other COPC.	100[11]	TRH (25), BTEXN (25), PAH (12), SVOC (6), VOC (6), metals (25), OCP (12), OPP (12)
	Potential uncontrolled fill (~3.7 ha)	25 of the above test pits will include sampling for other COPC.	100	TRH (25), BTEXN (25), PAH (12), SVOC (6), VOC (6), metals (24), OCP (12), OPP (12)
	Historical land uses (~4.5 ha)	26 of the above test pits will include sampling for other COPC.	104	TRH (26), BTEXN (26), PAH (13), SVOC (6), VOC (6), metals (26), OCP (13), OPP (13)

[10] Assuming two samples per test pit – noting that these samples are sieved with ACM fragments weighed, not submitted for laboratory analysis.
[11] It is expected that four soil samples per test pit will be collected, with one sample per test pit submitted for laboratory analysis in the first instance with the remainder of samples remaining on hold pending the results of preliminary analysis.

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Media	Area of Potential Concern	Number of Investigation Locations	Number of Samples to be Collected	Analytical Suite (no. of primary samples analysed)
	ASS	32 x soil bores to a depth of 6 m bgl	768[12]	Suspension Peroxide Oxidation Combined Acidity and Sulfur (SPOCAS) (192)[13] Chromium Reducible Sulfur (CRS) (10)[14]
	Background (to allow calculation of site specific EILs)	5 x surface soil samples from areas unlikely to have been impacted by site activities	5	Metals Cation Exchange Capacity (CEC) pH Clay content (% clay)
Groundwater	-	6 x new monitoring wells	MW01 – MW06	TRH (6), BTEXN (6), PAH (6), SVOC (6), VOC (6), metals (6), OCP (6), OPP (6), nutrients (6), pH

8.2 Subsurface Clearance

Due to the inherent risks associated with excavation works and the potential to intercept below ground services, JBS&G follows strict procedures to reduce the risk of striking any below ground services during ground disturbance works. The JBS&G procedures involve obtaining Before You Dig Australia plans and engaging a qualified service locator to mark out underground services (using a Cable Avoidance Tool and Ground Penetrating Radar). Site service plans, where available, will also be reviewed as part of the clearance works. Non-destructive drilling techniques (e.g. hand tools) are implemented for the top 1 m of all bores where possible, and may extend deeper where uncertainties remain regarding the presence of services.

8.3 Soil Sampling Methodology

8.3.1 Sampling for Asbestos

The following methodology will be followed for the asbestos in soil investigation.

- 147 1 m x 1 m test pits will be excavated in an approximately grid based pattern through fill material, extending to virgin/natural material beneath (anticipated to be 1.5 m bgl to 2 m bgl). The excavation will be such that the sidewall can be examined to assist in sample targeting.
- All sample locations will be recorded via GPS.
- One (1) 10L sample will be collected from each relevant stratum (or per 1 m depth) of one wall, with discretionary samples collected as necessary from other suspect spots.
- The samples will be screened manually through a <7mm sieve.

[12] Assumes a maximum bore depth of 6 m bgl, with samples collected every 0.25 m for field testing.
[13] It is assumed that 25% of the ASS field samples will be submitted for laboratory analysis.
[14] An allowance has been made for a small proportion of laboratory samples to be analysed for both SPOCAS and CRS in the event that conditions are observed in the field indicating high organic content in soil samples (e.g. peaty soil conditions).

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- Identified bonded ACM will be weighed to calculate asbestos soil concentration for individual samples, as per the methodology presented in Appendix 2 of DoH 2021.

8.3.2 Sampling for Other COPC

The following methodology will be followed for the investigation of COPC other than asbestos.

- A proportion of the 1 m x 1m test pits excavated for the asbestos investigation will be utilised for collection of samples to be analysed for other COPC (as per Table 8-1). The depth of test pits will be dependent on the thickness of fill materials observed in the field but is considered likely to be a maximum of 1.5 m bgl to 2 m bgl.
- Soil samples will be collected from a different wall of the excavation to the asbestos sampling, with samples collected at surface (0.0 – 0.1 m bgl), shallow depth (0.4 – 0.5 m bgl; 0.9 – 1.0 m bgl), and then at 1 m intervals based on lines of evidence including visual and/or olfactory evidence of impacts.
- The observed soils are to be logged in accordance with the Unified Soil Classification System, as well as observations of visual / olfactory indicators of potential soil contamination (i.e. discolouration, odour, etc.). Soil samples are to be screened for volatiles using a Photo Ionisation Detector (PID). PID readings are to be recorded on the bore logs.
- All soil sampling locations will be recorded with a handheld GPS unit.

8.3.3 Sampling for ASS

The following number of sample locations are proposed:

- Northern rural residential lots (~6 ha) – 12 sampling locations.
- Commercial/ industrial lots (~10 ha) – 20 sampling locations.

Sample locations are proposed to be soil bores advanced via direct push to a depth of 1 m below the maximum depth of disturbance. As a conservative measure, it is proposed that the depth of investigation is 6 m bgl.

ASS Field Testing

pH Test (pH_F)

The pHF test measures the existing acidity of a soil:water paste, and is therefore used to help identify if ASS are present. If the measured pH of the soil paste is pHF <4, oxidation of sulfides has probably occurred in the past, indicating the presence of actual ASS (AASS). Highly organic soils or heavily fertilised soils may also return a pHF close to 4. A pHF >4 but <5 indicates an acid soil, but the cause of the acidity will need to be further investigated by laboratory analysis. The pHF test does not detect any unoxidised sulfides (i.e. PASS). For this reason, this test must be used in conjunction with the pHFOX test.

Testing followed the procedure summarised below.

- The battery powered field pH meter will be calibrated.
- Separate test tube racks will be prepared for the pHF and pHFOX tests as contamination may occur when the pHFOX reactions are violent.
- Tests will be conducted at intervals on the soil profile of 0.25 m or at least one test per horizon, whichever is lesser.
- Approximately one teaspoon of soil sample (per test tube) will be removed from the profile and placed into the appropriate pHF and pHFOX test tubes.
- Deionised water (pH 5.5) will be added to the pHF test tube to make a paste stirring with a skewer or similar to ensure all soil 'lumps' are removed.

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- The pHF will be measured using a pH meter with spear point electrode, waiting for the reading to stabilise before recording the final pH measurement.
- All measurements will be recorded on a data sheet.

pH Peroxide Test (pH_{FOX})

The pHFOX test is used to indicate the presence of iron sulfides or PASS. This test involves adding 30 per cent hydrogen peroxide (pH adjusted to 4.5-5.5) to a sample of soil. If sulfides are present a reaction will occur. The reaction can be influenced by the amount of sulfides present in the sample, the presence of organic matter, or the presence of manganese. Once the reaction has occurred, the pH is measured.

A combination of three factors is considered in arriving at a 'positive field sulfide identification':

- A reaction with hydrogen peroxide—the strength of the reaction with peroxide is a useful indicator but cannot be used alone. Organic matter, 'coffee rock' and other soil constituents such as manganese oxides can also cause a reaction. Care should be exercised in interpreting a reaction on surface soils and high organic matter soils such as peats and 'coffee rock' and some mangrove/estuarine muds and marine clays. This reaction should be rated, e.g. L = low reaction, M = medium reaction, H = high reaction, X = extreme reaction, V = volcanic reaction.
- The actual value of pHFOX—if pHFOX <3, and a significant reaction occurred, then it strongly indicates PASS. The more the pHFOX drops below 3, the more positive the presence of inorganic sulfides.
- A much lower pHFOX than field pHF—the lower the final pHFOX value and the greater the difference between the pHFOX compared to the pHF, the more indicative of the presence of PASS.

Testing followed the procedure summarised below.

- The pH of the hydrogen sulphide will be adjusted to 5.0-5.5 prior to mobilisation.
- Separate test tube racks will be prepared as per the methodology for pHF.
- Tests will be conducted at intervals on the soil profile of 0.25 m or at least one test per horizon, whichever is lesser.
- Approximately one teaspoon of soil sample (per test tube) will be removed from the profile and placed into the appropriate pHF and pHFOX test tubes.
- A few drops of 30 per cent H2O2 adjusted to pH 4.5–5.5 will be added to the to the pHFOX test tube, and the mixture stirred.
- Approximately 20 minutes will be allowed for any reactions to occur. The rate of any reaction will be recorded using a slight (X), moderate (XX), vigorous (XXX) or very vigorous (XXXX) scale.
- The soil/peroxide mixture will be allowed to cool as placing an electrode into high temperature materials can result in physical damage and inaccurate readings.
- The pHFOX will be measured using a pH meter with spear point electrode, waiting for the reading to stabilise before recording the final pH measurement.
- All measurements will be recorded on a data sheet.

8.3.4 Soil Sample Handling

Collected soil samples will be placed directly into laboratory supplied sample jars/bags.

Collected soil samples required for laboratory ASS assessment will be immediately transferred to laboratory supplied snap-lock bags, excluding air to minimise oxidation of the samples as much as possible.

All samples will be placed directly into a pre-chilled ice chest, for transport to the testing laboratories.

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Chain of custody documentation will be completed for each batch of samples relinquished to the laboratory and included: sample ID; number of jars; media type; project ID; name; date; and time of relinquishment.

All samples will be retained in storage (frozen or specially dried) at the laboratory until the ASS and contamination investigations are finalised.

8.4 Groundwater Well Installation

It is proposed to install six (6) groundwater monitoring wells using push tube technology to 2m below encountered groundwater. Based on available information, groundwater may be approximately 7.5 m bgl in the north of the site, and as shallow as 1 m bgl in the south of the site.

Groundwater monitoring wells will be constructed with 50 mm Class 18 slotted and blank PVC pipe and finished with a steel gatic cover flush with ground level. It is intended that the groundwater wells will be screened with 3 m screens straddling the water table, which will assist in the assessment of the presence of surface infiltration to groundwater and Light Non-Aqueous Phase Liquid (LNAPL) (e.g. fuel/oils).

The installed monitoring wells will be developed using a submersible pump to remove turbidity and potential water introduced by the drilling and construction process. It shall be ensured that development is continued until such time that no visible sediment or turbidity is present in purge water, where practicable.

8.5 Groundwater Sampling

A groundwater monitoring event will be completed at the four (4) new monitoring wells to assess the groundwater quality beneath the site. Proposed monitoring well locations have been presented on **Figure 5**. Sampling will be undertaken a minimum of 5 to 7 days after monitoring well installation.

Groundwater sampling will be undertaken via low flow sampling technology. The proposed methodology for groundwater sampling is as follows.

- Depth to groundwater and total well depth, will be gauged using an oil/water interface probe. The interface probe will be decontaminated appropriately between locations.
- Groundwater purging and sampling will be undertaken for all wells using low-flow techniques at each location. Using a flow through cell and calibrated water quality meter, field parameters including pH, EC, dissolved oxygen, oxidation/reduction potential and temperature will be measured during purging and recorded on the sampling field sheet. The wells will only be sampled when all parameters have stabilised.
- Groundwater samples will be collected in dedicated sampling containers provided by the laboratory and immediately placed on ice in an insulated esky. The samples will be forwarded, under appropriate chain-of-custody (COC) documentation, to NATA accredited laboratory, Eurofins and MPL (secondary Laboratory), under strict chain of custody protocols. All samples will be returned to the laboratory within appropriate holding times for each of the analytes being tested.

8.6 Decontamination Procedures

All non-disposable sampling equipment will be decontaminated between sample locations by washing with Decon 90 and rinsing with potable water.

Rinsate samples will be collected daily from all non-disposable sampling equipment and submitted for laboratory analysis of COPC relevant to the day's sampling activities.

8.7 Quality Assurance and Quality Control

Duplicate and triplicate samples will be collected at a rate of 1:20.

One trip spike and one trip blank sample will be analysed per media per day of field works.

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8.8 Sample Labelling, Storage and Transport

Samples will be collected directly into appropriate laboratory supplied sampling containers (zip-lock bags or sample jars, as appropriate) and placed on ice in a chilled esky.

Sample labels will record the job number, sample identification, date of sampling and initials of the sampler.

All samples will be tracked by chain-of-custody documentation from leaving the site to arrival at the laboratory.

8.9 Waste Management

All soil investigation locations will be reinstated in the order which they were excavated. It is not anticipated that any spoil will be generated requiring management.

Purged groundwater (from both well development and sampling) will be discharged to ground unless visual or olfactory indication of contamination are observed, in which case it will be containerised and disposed of off-site to an appropriately licensed facility.

8.10 DSI Reporting

An interpretative report including an updated contaminant CSM will be prepared for the site in accordance with the NEPM 2013 and DWER reporting guidance for a DSI. Soil and groundwater analytical data obtained as part of the investigation works will be screened against applicable criteria to assess risks posed to on-site and off-site human and ecological receptors based on the proposed mixed residential, commercial, public open space land use. The report will contain the following elements:

- A concise executive summary, which clearly addresses the project objectives and outcomes.
- Copies of relevant field documentation including calibration certificates, soil bore logs, gauging sheets.
- Photos of the site recording aspects of the work undertaken.
- Copies of sample summary tables showing all analytical results.
- Copies of laboratory documentation.
- Site plans showing all sample locations and locations of any assessment criteria exceedances.
- An assessment of quality assurance / quality control including calculation of all required DQIs. Where field or laboratory based DQIs fail SAQP objectives, comprehensive discussions will be provided as to the source of the failure and potential implications for data quality.
- An assessment of compliance with the acceptable limits for decision error as determined in the DQOs for each analyte recorded at a concentration above the laboratory detection limit. Where acceptable limits for decision error are not met for any analyte, requirements for additional sampling and analysis to meet acceptable limits of decision error will be determined as per the procedure provided to AS4482.1-2005.
- Updating of the CSM based on environmental data and observations made during the site investigation.
- A clear statement identifying the requirement for further assessment and the rationale for any proposed further actions.
- Conclusions and recommendations regarding the contamination status of the site to clearly address the project objectives.

The report will be provided in draft electronic format for client review prior to being finalised. A final electronic (PDF) report will be issued.

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9. Assessment Criteria

9.1 Regulatory Guidelines

The investigation will be undertaken with consideration to aspects of the following guidelines, as relevant:

- National Environment Protection Council (NEPC), 2013, *National Environment Protection (Assessment of Site Contamination) Amendment Measure (ASC NEPM))* (No.1) 1999 as amended May 2013
- Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC Care, 2011).
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality, August 2018 (ANZG 2018).
- *Assessment and Management of Contaminated Sites*. Contaminated Sites Guidelines November 2021, WA DWER (2021).

Assessment criteria applicable to residential, commercial/ industrial and public open space land use have been selected given the expected future mixed use of the site.

Where Australian published guidelines are unavailable consideration will be given to the USEPA regional screening levels (RSLs).

9.2 Soil Assessment Criteria

9.2.1 Health Investigation Levels (NEPM 2013)

Health Investigation Levels (HILs) have been developed for a broad range of metals and organic substances. HILs are applicable for assessing human health risk via all relevant pathways of exposure and are generic to all soil types. HILs for low-density residential land use (HIL-A), high-density residential land use (HIL-B), public open space (HIL-C), and commercial/ industrial land use (HIL-D) will be adopted.

9.2.2 Health Screening Levels (NEPM 2013)

Health Screening Levels (HSLs) were developed for selected petroleum compounds and fractions and are applicable to assessing human health risk via the inhalation exposure pathways from site sources for a range of situations. The HSLs for low – high density residential land use (HSL-A & B), recreational/ open space land use (HSL-C) and commercial/ industrial land use (HSL-D) will be adopted. Based on the current understanding of the site, the coarse grain soil values will be used. HSL values applicable to the depth of sample collection will be applied.

9.2.3 CRC Care (2011)

CRC Care (2011) HSLs for direct contact to soil will be adopted from the CRC Care *Technical Report 10: Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater.*

9.2.4 Petroleum Hydrocarbon Management Limits (NEPM 2013)

Management Limits are applicable to petroleum hydrocarbon compounds only. They are applicable as screening levels following evaluation of human health and ecological risks and risks to groundwater resources. Management Limits relate to policy considerations which reflect the nature and properties of petroleum hydrocarbons including:

- Formation of observable light non-aqueous phase liquid (LNAPL).
- Fire and explosion hazards.

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- Effects on buried infrastructure.

Management Limits for residential, parkland and public open space land use and commercial/ industrial land use, coarse soil texture, will be adopted for this assessment.

9.2.5 Ecological Screening Levels (NEPM 2013)

The ecological screening levels (ESLs) were developed for selected petroleum hydrocarbon compounds and total petroleum hydrocarbon fractions and are applicable for assessing risk in terrestrial ecosystems. For the purposes of this assessment, urban residential and public open space and commercial/ industrial land use values for coarse soil texture will be adopted. The ESLs for areas of ecological significance have also been applied in consideration of the proximity of a Priority Ecological Community/ Threatened Ecological Community (PEC/TEC) as described in Section 9.3.

9.2.6 Ecological Investigation Levels (NEPM 2013)

Ecological Investigation Levels (EILs) for the protection of terrestrial ecosystems have been derived for common contaminant in soil based on a species sensitivity distribution model developed for Australian conditions.

Five background soil samples are proposed to be collected and analysed for metals, CEC, pH and clay content, to enable the calculation of site-specific EILs. EILs for both urban residential/ public open space land use and commercial/ industrial land use will be adopted. The EILs for areas of ecological significance have also been applied in consideration of the proximity of a PEC/TEC as described in Section 9.3.

9.3 Groundwater Assessment Criteria

Based on the presence of existing groundwater bores within the site, it is considered plausible that groundwater could be abstracted for domestic non-potable use (including garden irrigation), despite its varying quality (fresh to saline). Drinking water guidelines have not been considered as part of this assessment as the use of water for drinking water is implausible given the likely provision of scheme water to a new development.

The marine environment directly to the south of the site is the likely discharge location for groundwater, and therefore marine water guidelines have been applied. It is identified that the mapped extent of the Subtropical and Temperate Coastal Saltmarsh TEC/PEC and its associated buffers overly the site. This community is listed as a Priority 3 PEC within Western Australia, and a 'Vulnerable' TEC nationally under the *Environment Protection and Biodiversity Conservation Act* (EPBC Act). In consideration of the proximity of the PEC/TEC, it is considered appropriate to apply the 99% level of species protection.

9.3.1 Marine Water Quality Guidelines (ANZG 2018)

Default guideline values for toxicants have, where possible, been derived using the species sensitivity distribution model. The toxicant default guideline values for the protection of marine aquatic ecosystems have been adopted in consideration of the situation of the site immediately adjacent to the coast. Given the proximity of the PEC/TEC, the 99% species protection level is considered appropriate.

9.3.2 Non-Potable Groundwater Use (DoH 2014)

The non-potable groundwater use (NPUG) criteria (generally, 10-fold the drinking water criteria) are adopted to assess any risks to non-potable users of groundwater at the site or down hydraulic gradient of the site. This includes people who may be exposed to contaminated groundwater from domestic non-potable beneficial use of the aquifer (e.g., irrigation of gardens [including edible produce] or parks and reserves, washing vehicles and clothes, flushing toilets and recreational use of water).

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9.3.3 Groundwater Health Screening Levels (NEPM 2013)

Health Screening Levels (HSLs) were developed to be protective of human health by determining the reasonable maximum exposure from site sources for a range of situations (ASC NEPM 2013). The soil vapour HSLs for low – high density residential land use (HSL-A & B), recreational/ open space land use (HSL-C) and commercial/ industrial land use (HSL-D) will be adopted. Based on the current understanding of the site, the coarse grain soil values will be used. HSL values applicable to the depth of groundwater at the specific sampling location will be adopted, noting groundwater is expected to be anywhere between 1 m bgl and 7.5 m bgl across the site.

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10. Limitations

Scope of services

This report ("the report") has been prepared by JBS&G in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and JBS&G. This report is strictly limited to the matters stated in it and is not to be read as extending, by implication, to any other matter in connection with the matters addressed in it.

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Figures

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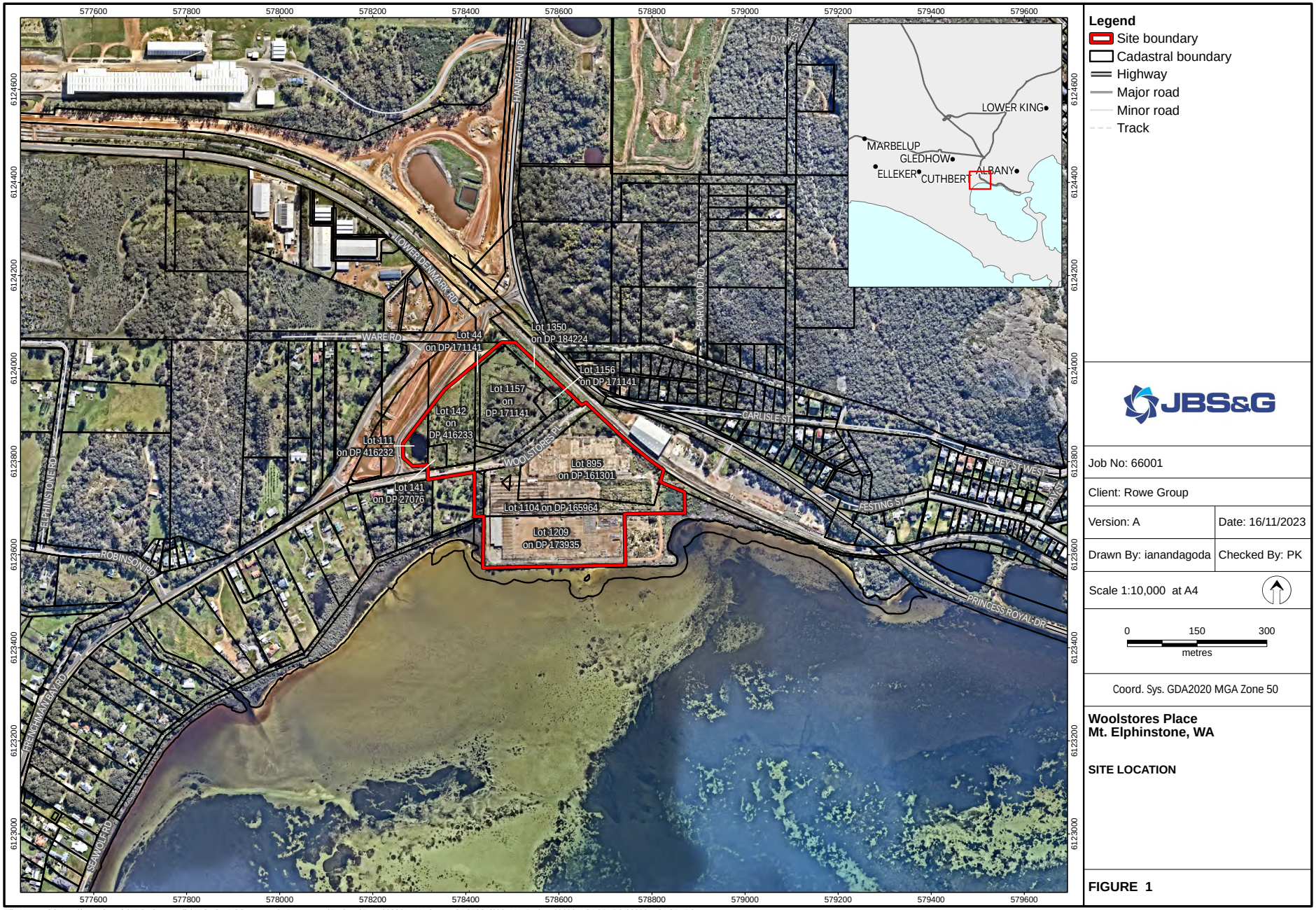

Legend

- Site boundary
- Cadastral boundary
- Highway
- Major road
- Minor road
- Track

JBS&G

Job No: 66001

Client: Rowe Group

Version: A	Date: 16/11/2023
Drawn By: ianandagoda	Checked By: PK

Scale 1:10,000 at A4

0 150 300
metres

Coord. Sys. GDA2020 MGA Zone 50

Woolstores Place
Mt. Elphinstone, WA

SITE LOCATION

FIGURE 1

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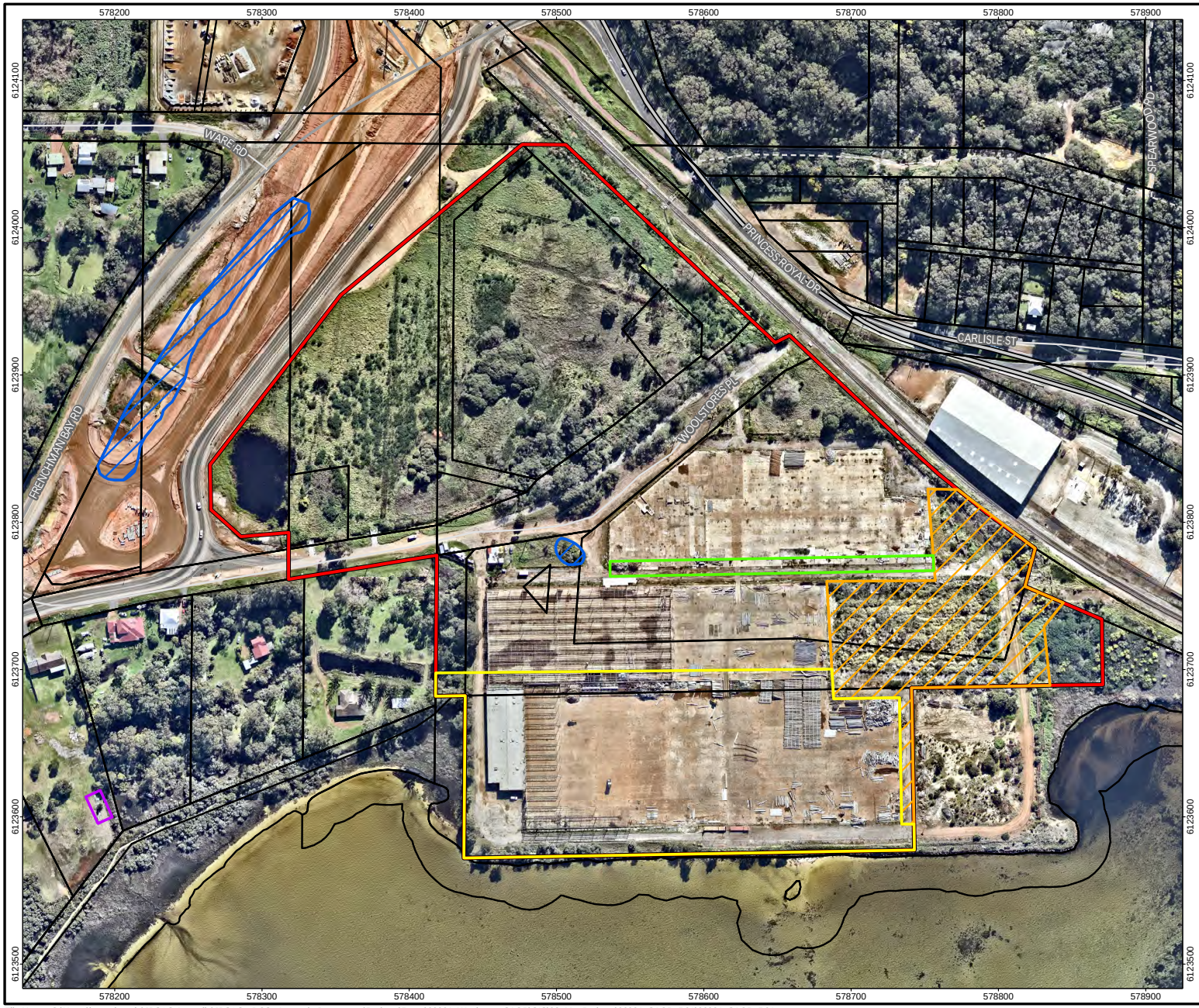

Legend

- Site boundary
- Reclaimed land
- Historical rail line/ drains/ sumps
- PACM sheets
- Stockpile
- Imported fill/fly tipping (PACM present)
- Cadastral boundary
- Highway
- Major road
- Minor road
- Track

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Job No: 66001	
Client: Rowe Group	
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Scale 1:3,500 at A4	

0 25 50
metres

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FORMER SITE LAYOUT

FIGURE 2

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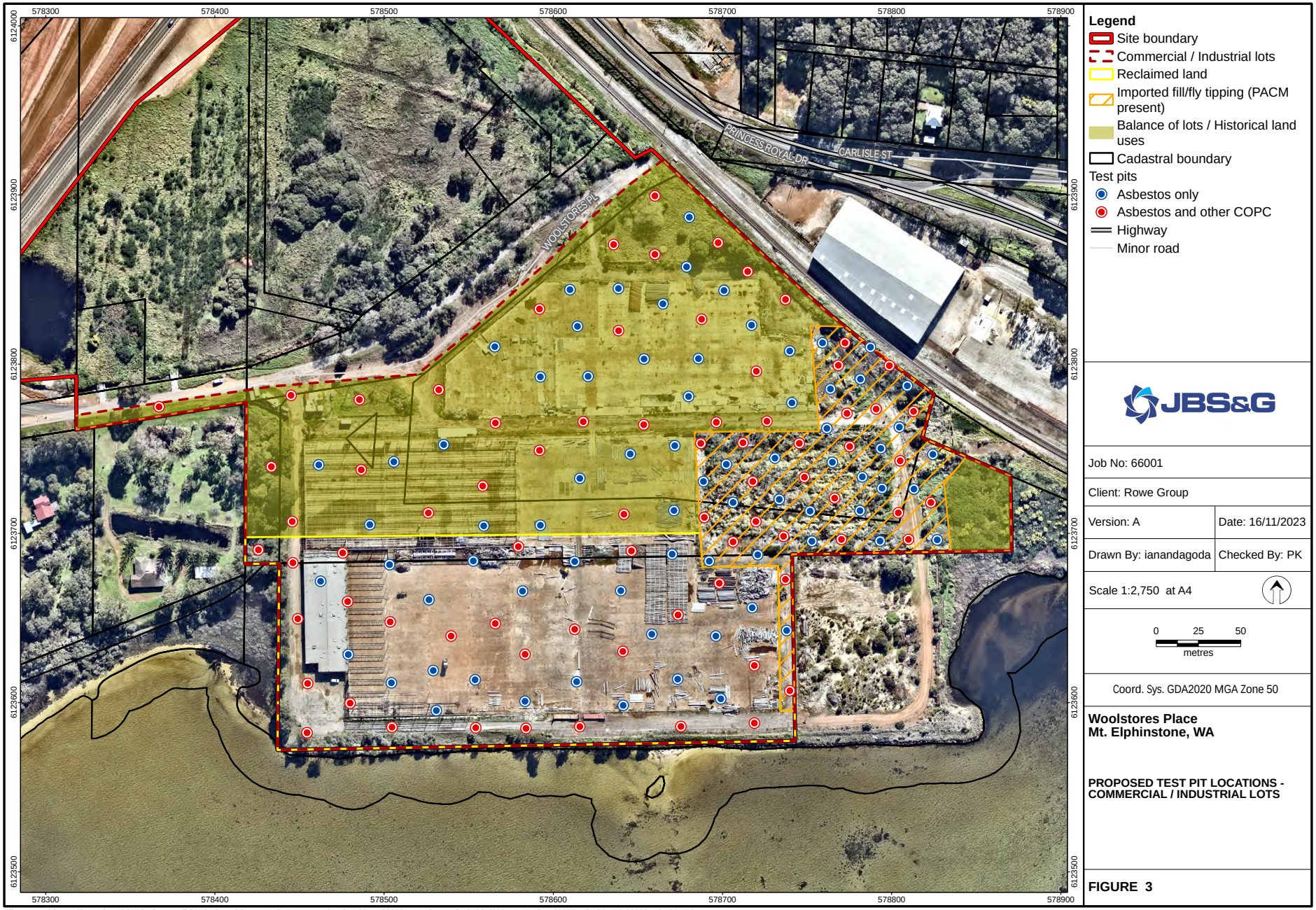

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Legend

- Site boundary
- Commercial / Industrial lots
- Reclaimed land
- Imported fill/fly tipping (PACM present)
- Balance of lots / Historical land uses
- Cadastral boundary
- Soil bore
- Highway
- Minor road

JBS&G

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Scale 1:2,750 at A4

0 25 50
metres

Coord. Sys. GDA2020 MGA Zone 50

Woolstores Place
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ASS INVESTIGATION - COMMERCIAL / INDUSTRIAL LOTS

FIGURE 4a

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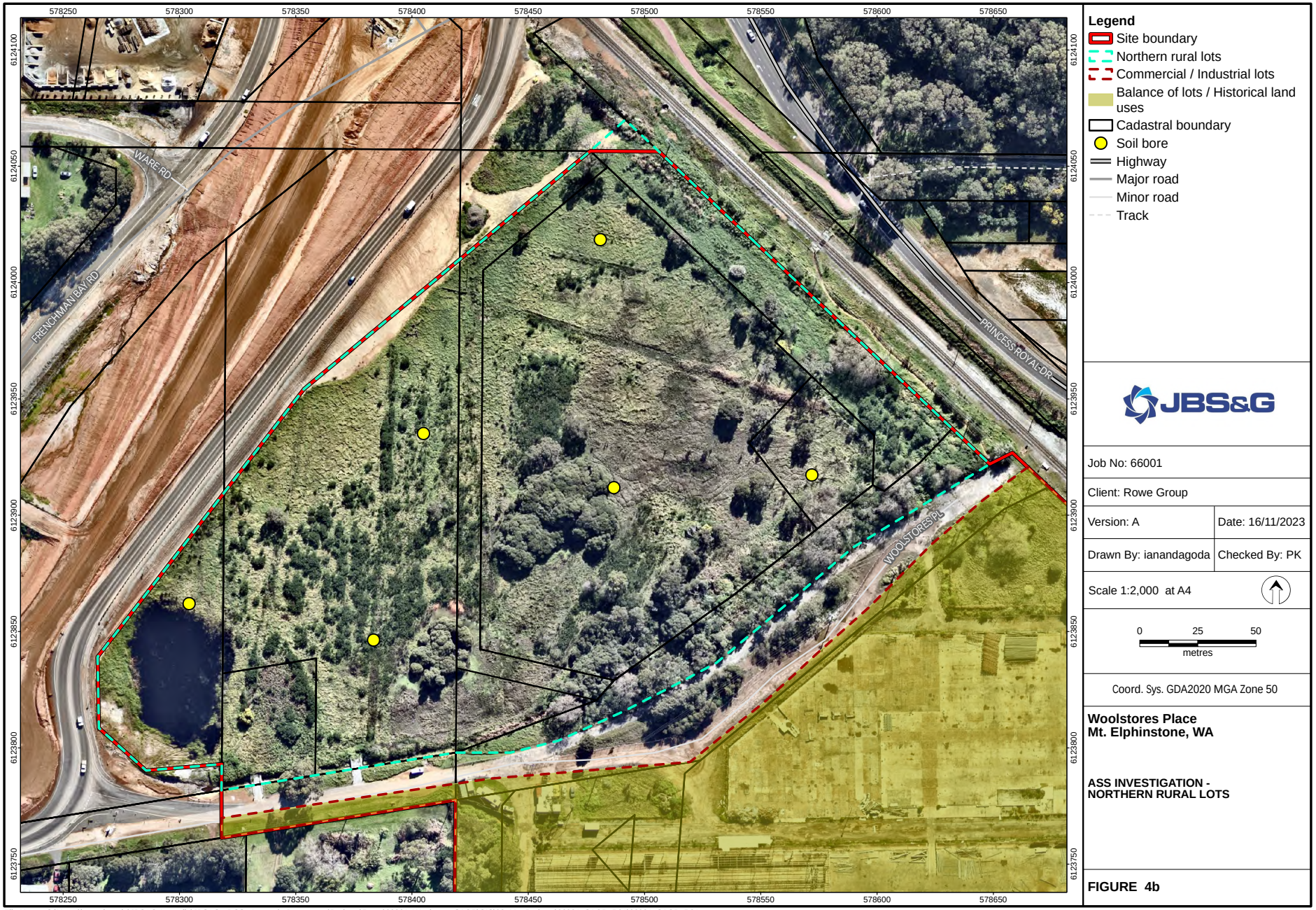

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Legend

- Site boundary
- Reclaimed land
- Imported fill/fly tipping (PACM present)
- Balance of lots / Historical land uses
- Commercial / Industrial lots
- Northern rural lots
- Cadastral boundary
- Highway
- Major road
- Minor road
- Track

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0 25 50
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PROPOSED GROUNDWATER MONITORING WELL LOCATIONS

FIGURE 5

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Albany Woolstores – Environmental Assessment Report

Rowe Group

Report

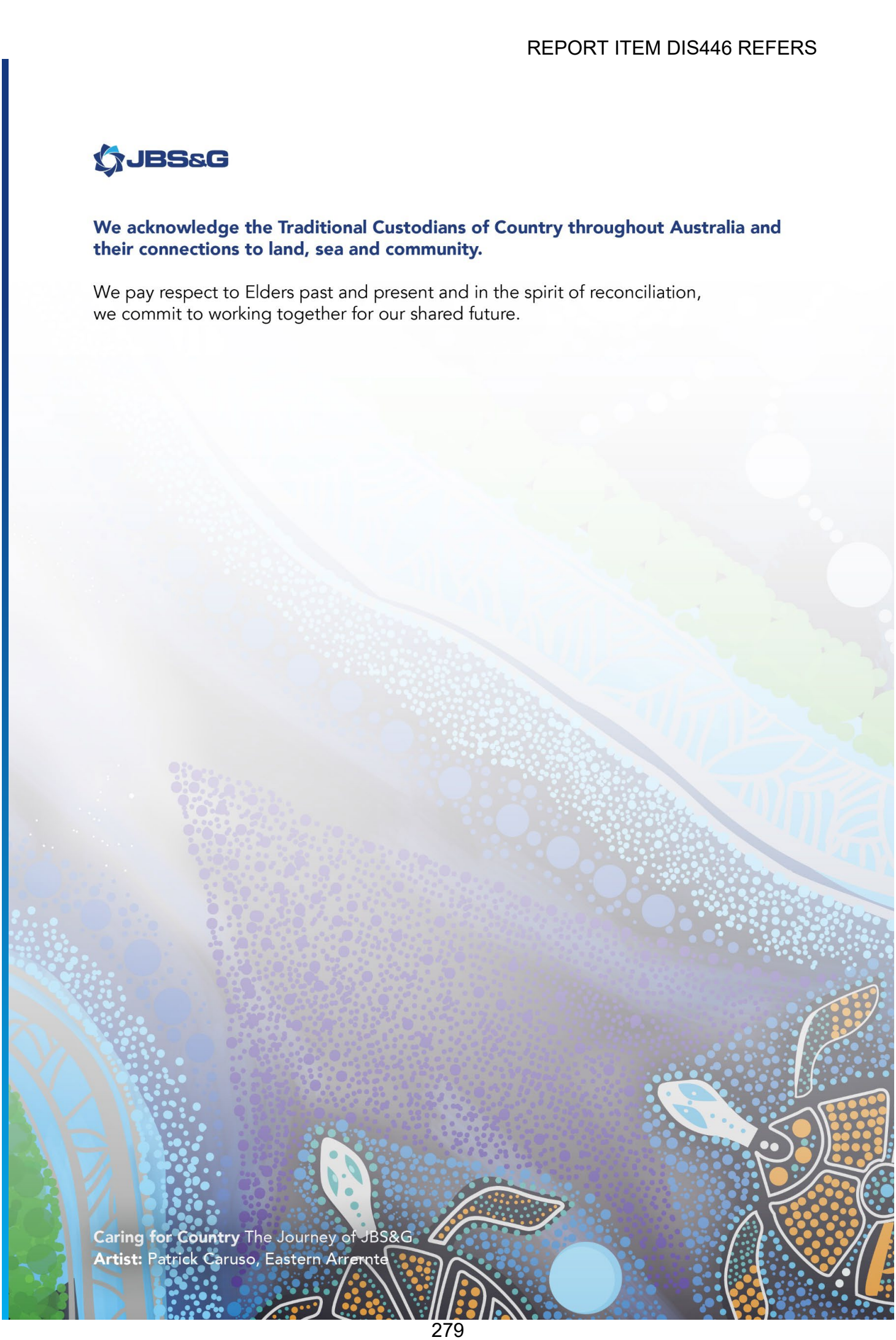
JBS&G 63996 | 147,313

22 August 2024

JBS&G

We acknowledge the Traditional Custodians of Country throughout Australia and their connections to land, sea and community.

We pay respect to Elders past and present and in the spirit of reconciliation, we commit to working together for our shared future.



Caring for Country The Journey of JBS&G
Artist: Patrick Caruso, Eastern Arrernte

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Appendices

Appendix A	**PMST Results**
Appendix B	**Flora Likelihood of occurrence assessment**
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1. Introduction

1.1 Background

Mainbeam Pty Ltd (Mainbeam) are preparing a Local Structure Plan (LSP) over nine lots on Woolstores Place, Mount Elphinstone located within the City of Albany (the site) (Figure 1-1). The site includes Mainbeam landholdings, as well as other State, Commonwealth, and privately owned land, within the area bound by Frenchman Bay Road, the Princess Royal Harbour waterfront, and the Princess Royal Drive.

The LSP area is located approximately 3.5 km west of the Albany Central Business District and covers a land area of 19.66 ha.

The focus of the proposed development will primarily be on the future use of the Mainbeam landholdings, exploring a mixture of tourist and quality medium to high density residential, with non-residential commercial land uses considered in close proximity to the rail corridor and future road interchange (the proposed development). It will recognise the rationalisation of land that will occur to facilitate the adjoining interchange construction, as well as the consolidation of land for development.

The LSP will outline a clear vision for the site, including the following opportunities and constraints:

- Integration of access and movement into the surrounding upgraded interchange and road network;
- Management of the land use transition from nearby industrial to commercial and through to waterfront residential;
- Mitigation of potential railway and traffic noise where required through the locating of non-residential (non-sensitive) uses and other measures;
- Coordination of normal urban servicing infrastructure, including reticulated sewer extension, to support the demand generated;
- Economic demand review of both residential and commercial land uses to ensure the scale of dwellings contemplated is supported and the commercial and tourist uses are recognised as both necessary and servicing a need;
- Management of environmental, ecological, and hydrological considerations, including any site remediation requirements as part of an overall environmental assessment;
- Review of the site's drainage (hydrology) and waterfront foreshore requirements (including Coastal Hazard Assessment Risk Reporting); and
- Review of relevant Aboriginal and Heritage considerations/issues.

1.2 Purpose & Scope

This Environmental Assessment Report (EAR) has been prepared to support the LSP including consideration of the following:

- Applicable legislation, policy, and guidance;
- The environmental, previous land use, bushfire, and heritage characteristics of the site;
- Potential impacts to the above characteristics associated with the proposed development;
- Relevant approval requirements; and
- The spatial and management response of the development to ensure that any identified potential impacts can be mitigated or managed in order to avoid 'significant' impact.

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1.3 Consultation & Stakeholder Engagement

1.3.1 Key Stakeholders

The following key stakeholders have been identified in relation to the proposed development:

- The Department of Climate Change, the Environment, Energy and Water (DCCEEW);
- Environmental Protection Authority (EPA);
- Department of Planning, Lands and Heritage (DPLH);
- The Western Australian Planning Commission (WAPC);
- The City of Albany (the City); and
- Local residents.

1.3.2 Regulatory Consultation

Consultation with key regulatory stakeholders is ongoing throughout the LSP design stage. An initial meeting was held between Mainbeam and the City of Albany/DLPH in June 2022. During that meeting the City of Albany) advised that amendments to the City of Albany Local Planning Scheme 1 (LPS 1) will not be accepted until the City's new local planning scheme is gazetted, which is not anticipated until 2023. As a result, the LSP for the site will now be lodged as a separate document with the City of Albany initially.

Following this, and while assessment of the structure plan is ongoing, a scheme amendment request is intended to be submitted to the City of Albany to confirm the intended zonings of the site and ensure there is an awareness for all stakeholders of how the new scheme, when gazetted, will operate with the structure plan. This aligns with ongoing liaison with the City of Albany and DPLH, particularly with DPLH's consent to preparation of a structure plan dated August 2022.

It is acknowledged that the scheme amendment request will not (and cannot) be initiated by the City until the new Local Planning Scheme No. 2 has been gazetted.

Consultation with Department of Water and Environmental Regulation (DWER_ (EPA Services (the Environmental Impact Assessment (EIA) Planning Branch) on 2 August 2022 (by JBS&G), confirmed that the EPA are currently assessing the City's new Local Planning Scheme (LPS 2). DWER confirmed that the City will not be proceeding with scheme amendments to the City of Albany Local Planning Scheme 1 (LPS 1), so a scheme amendment for this proposal is unlikely to proceed at this time. DWER confirmed that the proposed structure plan for the site is not a statutory document, and as such EPA Services does not provide comment. However, DWER's regional office may provide comment via the City's usual consultation and referral process.

Rowe Group, on behalf of Mainbeam, also consulted with officers from DWER and Department of Biodiversity, Conservation and Attractions (DBCA). An overview of the outcomes of the meetings are summarised below in Table 1-1.

Table 1-1: Summary of Agency Consultation

Agency	Date	Summary
City of Albany/DPLH	3rd June 2022	Meeting with Rowe Group and City of Albany and DPLH to discuss: • City of Albany draft local planning scheme; • Timing of scheme amendment;

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		• Structure Plan not subject to same level of env. assessment as scheme amendment
DWER	2nd August 2022	Manager EIA Planning Branch (EPA Services), confirmed they are currently assessing City of Albany LPS 2 and that the City of Albany won't be proceeding with scheme amendments to LPS 1. It was also confirmed that as structure plans not statutory documents, EPA Services does not provide comments on them. DWER's regional office may comment on them via the standard City of Albany consultation process.
	15th November 2022	DWER confirmed an ecological assessment is required for structure planning stage to enable informed development of the structure plan and consideration by relevant agencies.
	18th November 2022	Senior Environmental Officer of DWER confirmed a Preliminary Site Investigation is required for the structure plan and that a Detailed Site Investigation would only be required to inform future stages of development (i.e., scheme amendment and/or subdivision) based on current knowledge of the site.
DBCA	15th November 2022	DBCA encouraged controlled access to the foreshore and noted the intent to prepare an ecological assessment to inform preparation of the structure plan. DBCA considered the proposal would likely represent an indirect impact to a threatened ecological community adjacent the structure plan area. The aforementioned ecological assessment would aid this process and enable informed consideration by all stakeholders.

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Legend
- Project area
- Cadastre (LGATE-002)
- Major road
- Minor road
- Track

Scale: 1:25,000 at A4

0 250 500
metres

Coord. Sys. GDA2020 MGA Zone 50

Job Number: 62317

Client: Rowe Group

Version: A | Date: 01-Sep-2022

Drawn By: cthatcher | Checked By: NM

THE SITE

FIGURE 1.1

strategen JBS&G

File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\Rowe\62317 Woolstores PI Structure Plan Env Studies\GIS\Maps\R01\62317_Woolstores_PI_R01_V1.aprx
Image Reference: World Imagery: Maxar

2. Legislation, Policies& Guidelines

This section outlines the relevant Commonwealth, State and Local legislation, policies and guidance that are applicable to the proposed development.

2.1 Federal

2.1.1 Environmental Protection and Biodiversity Conservation Act 1999

The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) is administered by the Department of Climate Change, Energy, the Environment and Water (DCCEEW). The EPBC Act aims to protect and manage Matters of National Environmental Significance (MNES) throughout Australia including:

- World Heritage Properties;
- National Heritage Places;
- Wetlands of International Importance (listed under the Ramsar Convention);
- Listed threatened species and ecological communities;
- Migratory species protected under international agreements;
- Commonwealth Marine Areas;
- The Great Barrier Reef Marine Park; and
- Nuclear actions (including uranium mines).

2.1.2 Referral & Approvals – Albany Ring Road Project

The Albany Ring Road Project to the north of the site was the subject of an EPBC referral and assessment. The assessment area for the Ring Road project encroaches into the Woolstores project site in the Northern border of the site. Black Cockatoos and Western Ringtail Possum were identified as being potentially impacted by actions with potential habitat losses. The following documents were prepared to support the lodgement of the EPBC referral (2020/8769 – Albany Ring Road Stages 2 and 3B):

- Albany Ring Road EPBC Supporting Document;
- Albany Ring Road Biological Survey;
- Albany Ring Road Western Ringtail Possum Survey;
- Albany Ring Road Black Cockatoo Assessment; and
- Albany Ring Road Aboriginal Heritage Survey.

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Approval under the EPBC Act was granted on 22 November 2021 to Main Roads Western Australia (MRWA) (by the Minister for the Environment) with the following conditions applied:

- Avoidance and mitigation requirements (to protect Black Cockatoo species and the Western Ringtail Possum);
- Fauna Management Plan;
- Offset Strategy and Management Plan; and
- Compliance conditions including annual compliance reporting (and the revision of any action management plans as required).

2.2 State

Environmental assessment has been conducted with reference to the following state (WA) legislation which provides for the environmental and heritage values, and bushfire risk addressed within this report, including:

- *Biodiversity Conservation Act 2016* (BC Act);
- *Environmental Protection Act 1986* (EP Act);
- *Biosecurity and Agriculture Management Act 2007* (BAM Act);
- *Rights in Water and Irrigation Act 1914* (RIWI Act);
- *Metropolitan Water Supply, Sewerage and Drainage Act 1909*;
- *Aboriginal Heritage Act 1972 (WA)* (AH Act);
- *Contaminated Sites Act 2003* (CS Act);
- *Contaminated Sites Regulations 2006* (the Regulations); and
- *Planning and Development Act 2005* (PD Act).

2.2.1 Environmental Protection Act 1986

The EP Act is administered by the EPA. The EP Act provides for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement, and management of the environment and for matters incidental to or connected with the foregoing.

Part IV of the EP Act makes provisions for the EPA to undertake environmental impact assessment of significant proposals, strategic proposals, and land use planning schemes. The EPA uses environmental principles, factors, and associated objectives as the basis for assessing whether a proposal or land use planning scheme's impact on the environment is acceptable.

In accordance with Section 38 of the PD Act, all proposed Schemes and amendments are referred to the EPA for assessment against their Environmental Principles, Factors, and Objectives.

2.2.1.1 Environmental Protection Authority Referral

The Albany Ring Road Project (Albany Ring Road Stage 2 and 3b) to the Northern boundary of the site, was referred to the EPA on 20 May 2020 by MRWA. The EPA determined under Section 39A not to assess the proposal, based on the following reasons:

- The likely impacts of proposal were determined not so significant to warrant formal assessment;
- Potential impacts of the proposal can be adequately managed through the implementation of the proposal in accordance with the referral documentation and the proponent's management and mitigation measures (including limiting clearing, procedures to manage fauna impacts during clearing

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and construction, infrastructure to facilitate fauna movement and revegetation of 20 ha of fauna habitat); and

- The EPA noted that the BC Act and also the requirement for a Part V Division 2 (Clearing) permit for any native vegetation to be cleared for works required.

The proposal to rezone much of the site from general industrial to commercial and through to waterfront residential triggers several issues. Given its proximity to the Princess Royal Harbour, tidal influences, and rising sea levels it will likely require coastal hazard assessment risk (CHARs) work to be completed (by an accredited practitioner), that will require technical assessment and review by the EPA.

A total of 126 conservation-significant fauna species were identified by the database search within 30 km of the site (Appendix C).

Of these, 48 'Threatened' fauna species were listed under Section 178 of the EPBC Act and Section 19(1) of the BC Act, with three species within the site, *Charadrius leschenaultia* (the Greater Sand Plover; or the Large Sand Plover), *Calidris canutus* (the Red Knot) and *Calidris tenuirostris* (the Great Knot).

A total of five Priority Ecological Communities (PEC)were identified within 50 km of the site.

The City of Albany has advised that new City of Albany Local Planning Scheme 2 (LPS 2) is currently under assessment by the EPA and that amendments to the existing City of Albany Local Planning Scheme (LPS 1) will not be considered at this time. A structure plan is currently in preparation for the site, and this EAR supports that plan. It is anticipated that that the structure plan will involve consultation with the local DWER office only (not EPA referral). Any subsequent scheme amendment for the site, will requirement EPA referral under Section 48A of the EP Act.

2.2.2 Biodiversity Conservation Act 2016

The BC Act has now superseded the *Wildlife Conservation Act 1950* (WC Act). On 3 December 2016, several parts of the BC Act were enacted by the State Governor. The remaining parts of the BC Act and the associated regulations came into effect on 1 January 2019.

In addition to providing for the protection of flora and fauna, the BC Act includes provisions for threatened ecological communities, threatening processes, critical habitats, and environmental pests.

2.3 State (WA) Planning Policies

State planning policies are prepared and adopted by the WAPC under statutory procedures set out in Part 3 of the PD Act. The relevant state planning policies are listed below:

- State planning Policy 2.6: State Coastal Planning;
- State Planning Policy 2.7: Public Drinking Water Source Policy;
- State Planning Policy 2.9: Water Resources;
- State Planning Policy 3: Urban Growth and Settlement;
- State Planning Policy 3.7: Planning in Bushfire Prone Areas; and
- State Planning Policy 5.4: Road and Rail Transport Noise and Freight Considerations in Land Use Planning – Section 5.3: Noise Criteria;

The Lower Great Southern Strategy (2016) which guides land use planning and provides strategic direction for the Lower Great Southern for the next 20 years, through the following objectives:

- Providing guidance at a sub-regional level in the use of land to balance economic, social, and environmental considerations;

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- Maintain and enhance function of the Port of Albany in light of envisaged long-term growth and productivity within the wider Great Southern region;
- Support the Lower Great Southern community in being adaptive and resilient to climate change;
- Minimise potential environmental impacts from coastal development proposals through effective management and recognition of coastal processes including sea level rise, and sufficient setbacks;
- Provide and maintain public access to coastal and estuarine foreshores;
- Protect threatened flora, fauna, and ecological communities; and
- Maximise opportunities for the development and growth of a sustainable tourism industry.

2.4 Local Planning Context

The City of Albany has developed numerous polices, strategies and guidelines relevant to planning and the environment, (and this proposed development in particular) that are listed below. Reference to these documents has been made throughout this report where applicable to a specific environmental factor.

- City of Albany Town Planning Scheme 1;
- City of Albany – *City of Albany Policy, Woolstores Redevelopment Site*;
- City of Albany (2019) – *Local Planning Strategy*;
- *City of Albany Tourism Accommodation Planning Strategy*; and
- City of Albany/WAPC - *Emu Point to Middleton Beach Coastal Hazard Risk Management Adaption Plan* (December 2019).

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3. Existing Environment

This section of the EAR describes the existing physical, and socio-economic environment in which the Proposed Development exists and identifies relevant values and sensitivities that it may affect.

3.1 Lots boundaries

Table 3-1 and Table 3-2 show whether the lots addressed in this report are found within or outside of the Proposed Development area (the site).

Table 3-1: Lots boundaries within the site

Lot
11
76
140
201
895
1104
1209

Table 3-2: Lot boundaries outside the site

Lot
1-10
52-55
76
91
151
201
402
492
877
893

3.1.1 Previous Land Use(s) of Lots within and outside of the site

Construction on the site commenced in 1923 and operations as a woollen mill began in 1925, due primarily to its proximity to the Northern freight line. The original building housed a main building with roof comprising corrugated asbestos and 2 boilers connected to a 30m high smokestack. The mill went through various financial challenges and market reviews and went into administration in 1996.

The operation and its associated facilities entered into administration in 1996 and have remained unused since.

Table 3-3: Summary of Historical Aerial Photograph Observations

Date	General Observation	Lot Specific Observations

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1954	• First available photograph, Woolstores place seems to be a sealed road. • The surrounding land remains mainly uncleared.	• All lots remain uncleared with the exception of Lot 895 which contains a commercial/industrial building, Lot 54 and Lot 53 also contains a small residential dwelling.
1961	• Remains largely unchanged from previous photo. • The surrounding land remains mainly uncleared.	• Lot 895 had expanded its commercial/industrial building into Lot 1104. • Lot 492 is occupied by a surface water body. • Lot 55 and 52 now contain residential dwellings in the northern portion of their lots. Lot 55 also contains a drainage channel that feeds into Lockyer Bay
1977	• Land within the lots has been cleared for agricultural purposes. • Surrounding land continues with residential development to the west, and industrial/commercial development to the north.	• The expansion of the commercial/industrial building on Lot 895 has continued and now occupies Lot 895, Lot 1104, and Lot 1209. • Lot 402 has been cleared and a hardstand base appears to be installed. • Lot 492 the surface water body is no longer present, and agricultural clearing has occurred. • Lot 140 further development of residential property at northern part of the lot. • Lots 52, 53, 54 and 55 have been cleared of vegetation to the state they are in the 2020 aerial
1988	• Remains largely unchanged from previous photograph. • Commercial/industrial development continues to the north and east of the lots.	• Remains largely unchanged from previous photograph. • A surface water body has appeared on Lot 140 • Lot 52 contains a driveway that extends along the western boundary of the site and finishes at a building pad for a future house. The surface water body on Lot 52 is more defined.
1996	• Remains largely unchanged from previous photograph. • Commercial/industrial development continues to the north and east of the lots.	• Residential building developed on Lot 11. • Residential building on Lot 52 in the southern portion of the Lot has been built
2007	• Remains largely unchanged from previous photograph. • Commercial/industrial development continues to the north of the lots.	• The commercial/industrial building that crosses over Lot 895 and Lot 1104 demolished. • Lot 54 now contains a secondary residential dwelling in the northern portion of the lot.
2012	• Remains largely unchanged from previous photograph.	• Lot 55 now contains a shed along the western boundary of the lot.
2018	• Remains largely unchanged from previous photograph. • Commercial/industrial development continues to the north of the lots.	• Lot 140 has developed a dam like structure along the eastern border of the lot. • Surface water bodies are present in Lot 151.
2020	• Remains largely unchanged from previous photograph.	• Remains largely unchanged from previous photograph.

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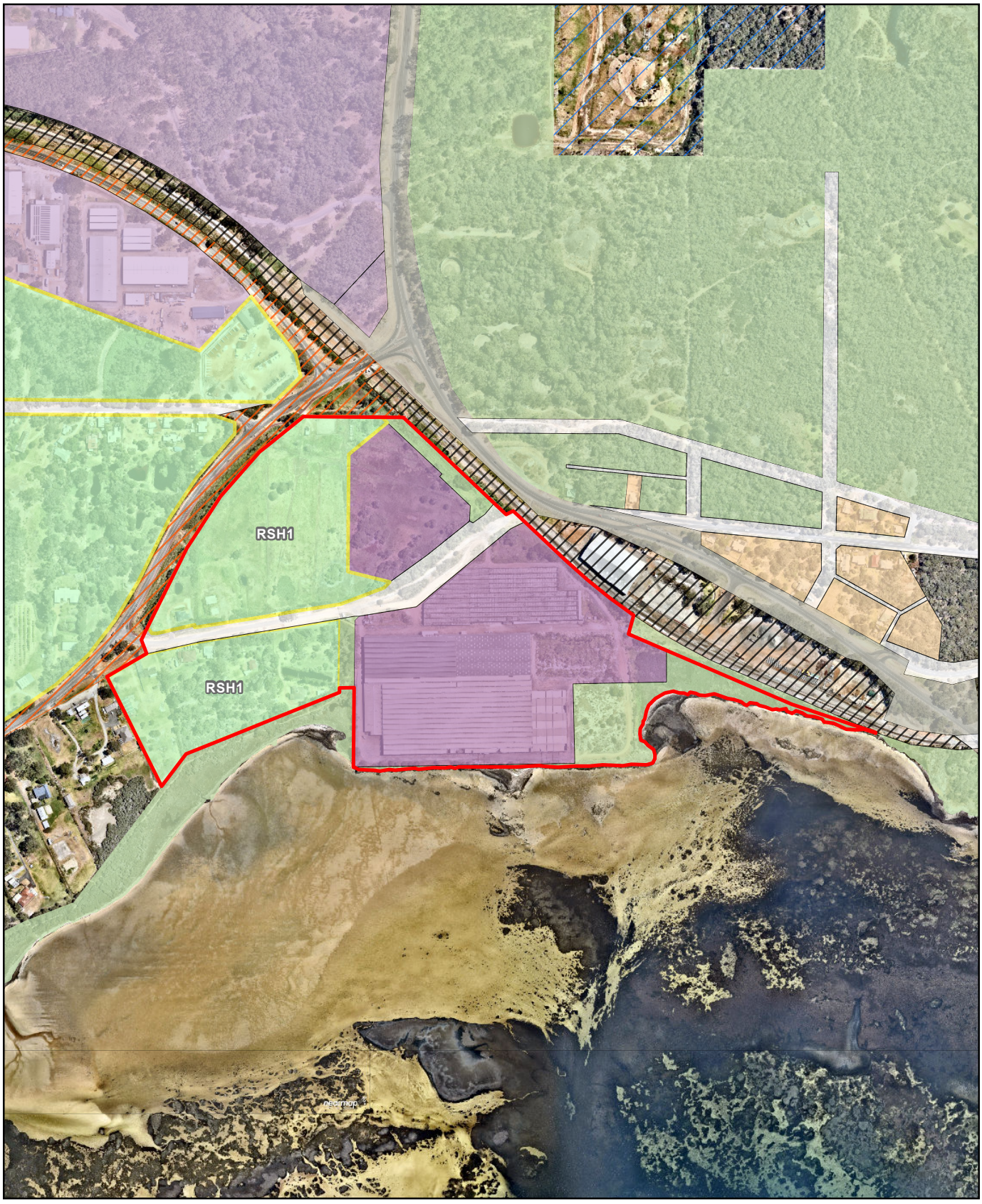

Legend

- Project area
- Cadastre (LGATE-002)

Local Planning Scheme - Zones and Reserves (DPLH-071)

- General industry
- Light industry
- Local road
- Major road
- Parks and recreation
- Priority road
- Public use
- Rail
- Residential
- Rural small lot holdings
- Tourist residential
- Major road
- Minor road
- Track

Scale: 1:7,000 at A4 (0 50 100 metres)

Coord. Sys. GDA2020 MGA Zone 50

Job Number: 62317

Client: Rowe Group

Version: A | Date: 01-Sep-2022

Drawn By: cthatcher | Checked By: NM

SURROUNDING LAND USES

FIGURE 3.1

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File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\Rowe\62317 Woolstores Pl Structure Plan Env Studies\GIS\Maps\R01\62317_Woolstores_Pl_R01_V1.aprx
Image Reference: www.nearmap.com© - Imagery Date: January 2022.

3.2 Climate

The subregion experiences a relatively temperate Mediterranean climate, with warm, dry summers and cool, wet winters. The closest Bureau of Meteorology-operated weather station is the Albany Weather Station (Station ID 9500), which has been operational since 1877 (Figure 3-2).

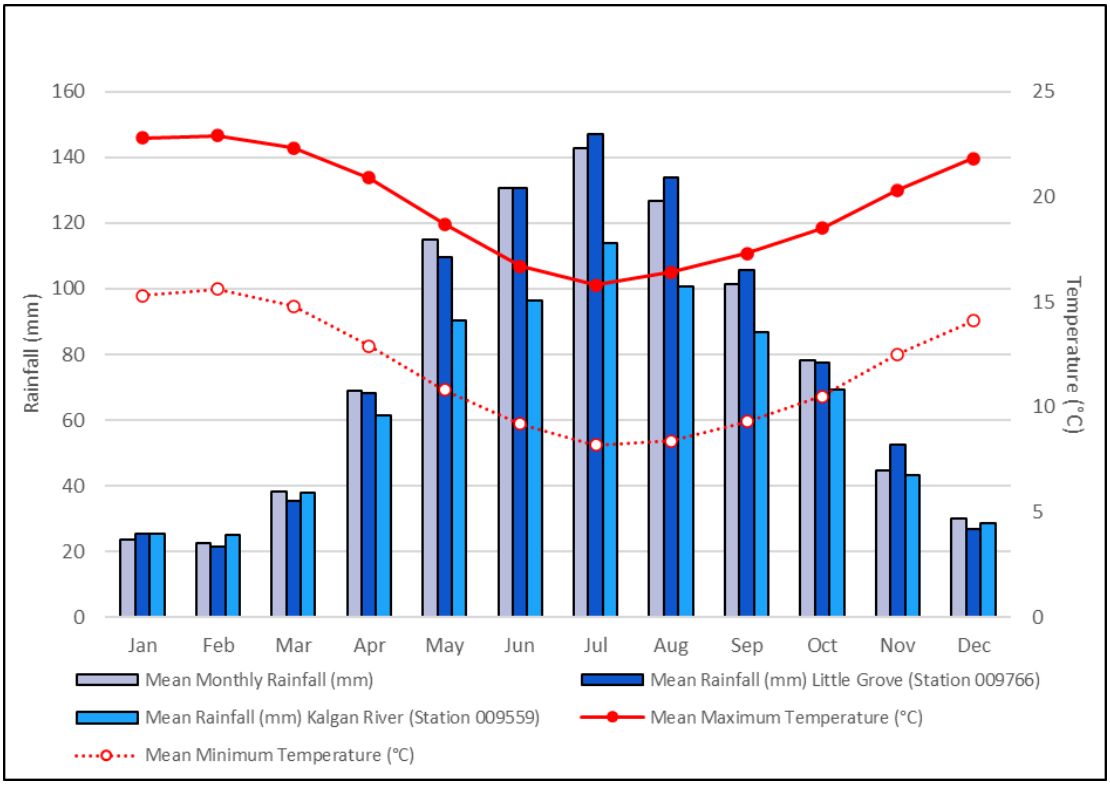

Figure 3-2: Climate Statistics for Albany

The average annual rainfall is 925.2 mm, with the highest monthly rainfall occurring from May to September. The wettest year on record was 1955, with an annual rainfall of 1,395.2 mm, of which 255.3 mm fell in August. The highest recorded monthly rainfall was 292.82 mm which fell in June 1920.

The average monthly maximum temperature ranges from 15.8°C in July to 22.9 °C in February. Average monthly minimum temperatures range from 8.2 °C in July to 15.6 °C in February. The hottest recorded day was 44.8 °C in February 1933, and the lowest minimum temperature of 0.1 °C was recorded in July 1943.

3.3 Topography

Regional topographic contour mapping by the Department of Primary Industries and Regional Development (DPIRD) (2019) indicates that the site is relatively flat to slightly undulating, with elevation ranging from 10 m Australian Height Datum (AHD) to 2 m AHD toward the south. Elevation is steepest toward the northmost portion of the site (Figure 3-4).

3.4 Geomorphology & Soils

The site is located in the Albany-Fraser Orogen Nornalup Complex Range Formation, the geological unit of which the site is based comprises Mesoproterozoic granite and pegmatite. This geological unit is described by Geoscience Australia (2008) as follows:

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- Mg 74405: Granite, metagranite, Equigranular to porphyritic granite; leucocratic granite; biotite granite with potassium feldspar phenocrysts in places; foliated adamellite; mixed granitic rocks; dioritic rocks.

The site is located within the Torbay soil systems, specifically within the Owingup soil subsystem. The Owingup subsystem is described by DPRID (2019) as follows:

- 242TbOW: Plains with swamps, lunettes, and dunes. Yellow solonetzic soils, organic loams, and diatomaceous earth; Wattle-Paperbark thickets, Teatree heath and reeds. Podzols on dunes; Banksia-Sheoak woodland.

The geomorphology and soil(s) that the site is comprised of contribute to the narrow, swampy coastal plain that makes up the southern portion of the Albany Sandplain hydrological zone. The soils are described by DPIRD (2019) as being relatively non-saline, pale-deep sands that generally support sedgelands and paperbark thickets.

3.4.1 Princess Royal Harbour

The site is located on the foreshore of the Princess Royal Harbour which is an embayment connected to King George Sound via a narrow channel. Princess Royal Harbour is 28.8 square kilometres (km2) in area has gently sloping, shallow, sandy margins surrounding deeper (5-10 m) basins. Roughly half of Princess Royal Harbour is less than 2 m deep (Bastyan 1986, EPA 1990a in Strategen 2008).

3.4.2 Acid Sulphate Soils

Acid Sulphate Soils (ASS) are naturally occurring, iron sulphide-rich soils, sediments, or organic substrates, formed under inundated/waterlogged conditions. When exposed to oxygen, these sulphides can oxidise and release sulfuric acid and heavy metals. This process can occur due to drainage, dewatering or excavation.

The ASS risk mapping available from the Australian Soil Resource Information System (ASRIS) (2013) and DWER (2017). The site is classed as having a 'High Probability of Occurrence' (ASRIS 2013) and/or 'High to Moderate risk' (DWER 2017) of ASS occurring within 3 m of the natural soil surface that could be disturbed by most land development activities (refer to Figure 3-6).

3.5 Hydrology

3.5.1 Groundwater

Regional hydrological mapping (DWER 2017) indicates that the site is underlain by the Bremer West Superficial Aquifer. Groundwater quality in the broader area is fresh to saline, with approximate total dissolved solid concentrations being between 100 to 100,000 mg/L.

Given the site's proximity to the coast, groundwater levels range from approximately 7.5 metres below ground level (mbgl) to less than 1 mbgl, with surface expressions of groundwater presenting themselves throughout the southern portion of the site. Groundwater flow direction within the Site broadly flows in southward toward the coast (Figure 3-7).

Early results from groundwater sampling in July 2022, by the hydrology consultant have indicated elevated levels of nutrients within the site, particularly within the shallow aquifers, which may be associated with surrounding land uses. This may need to be confirmed by further baseline studies and investigations.

3.5.1.1 Groundwater Licences

No groundwater licences currently exist within the site.

3.5.1.2 Groundwater Abstraction

As no groundwater licence currently exists within the site, no groundwater abstraction bores occur within the site (DWER (2022); however, there are four registered groundwater bores that exist onsite. The details of these 4 registered groundwater are summarised in Table 3-4below.

Table 3-4: Registered Groundwater Bore Details

Licence	Depth (Mbgl)	Purpose	Custodian
60210115	4.0	Groundwater monitoring bore	DWER
60210116	8.3		
60210117	11.2		
60210118	14.3		

3.5.2 Groundwater Protection Areas and Public Drinking Water Source Areas

The site does not fall within any Groundwater Protection Area or Public Drinking Water Source Areas. The closest protectable groundwater area is approximately 1.5 km to the west of the site.

3.5.3 Surface Water – Princess Royal Harbour Catchment

The site is situated within the Princess Royal Harbour hydrological catchment and sub-catchment of the Albany Coast Basin. There are no perennial waterways onsite; however, surface expressions of groundwater present themselves on a seasonal basis. No significant, Nationally Important (Directory) and/or Ramsar-listed wetlands are present within the site. Surface water drainage networks drain through the site (from the North) via a main open channel, into three catchments as detailed in Figure 3-7.

The site is not within a mapped 100 Year ARI Floodplain Area; however, given its proximity to the foreshore flat of the Royal Princess Harbour, it is subject to inundation. Coastal Hazard Risk Management Adaption Planning (CHARMAP) has been undertaken by the City of Albany for the Emu Point to Middleton Beach areas, with a Plan publicly released in December 2019. Consultation with City of Albany Senior Planner in June 2022 concluded that any new structure plan will need to consider the Special Control Area (SCA) proposed in the draft scheme. The SCA is based on a 1:100-year rainfall event, current topography and soil knowledge and mapping and will need to account for inundation, erosion, sea level rise. Work is currently being undertaken on CHARs hazard lines outlining 1-, 10- and 100-year scenarios. The next proposed steps for that work include:

a. Identifying and analysing ramifications from each hazard line.

b. Vulnerability analysis of existing infrastructure etc.

c. Risk assessment – rankings from tolerable to immediate action required.

d. Adaption and management plan.

It is understood that CHARMAP work that is specific to the project area is due for completion in 2023 and is based primarily on risks associated with inundation, rather than storm surge. Geotechnical investigation will likely be required if underground or basement parking is anticipated for the site.

Consultation with the hydrology consultant has confirmed that for the site to function effectively, no more than 15 mm of stormwater and runoff should be permitted to infiltrate directly to the site, with the remainder of the flow directed to Princess Royal Harbour, via the three existing catchment networks.

3.5.4 Geomorphic Wetlands

Three conservation category wetlands (CCW) were identified via review of the Southern Geomorphic Wetland Database, approximately 1.5 km to the North-west of the site, as shown in Figure 3-3. Given that these wetlands are relatively small and upstream from the site their respective impact on the site and the development overall is expected to be minimal as is the level of any potential assessment from respective regulators.

No major rivers or streams enter Princess Royal Harbour, with freshwater primarily entering the system through groundwater, surface water runoff from within the small catchment, and direct rainfall (ERM 1995).

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3.5.5 Coastal Saltmarsh

Remnant native vegetation external to the site includes saltmarsh on the coastal margin of Princess Royal Harbour. The saltmarsh is part of the mapped extent of the TEC – the Subtropical and Temperate Coastal Saltmarsh (refer to Section 3.7.5) which is confined to marine saline habitats. The interactions between tides, weather (e.g., evaporative loss), groundwater influences and vegetation result in complex patterns of environmental variation for the Coastal Saltmarsh (DSEWPC 2013).

The unifying factor for all Coastal Saltmarsh TEC is some form of tidal connection and inundation, with most areas draining fully on the ebb tide. Groundwater connectivity to the tidal Princess Royal Harbour may also play a role in the occurrence of species which have a preference for water logging, such as samphire (DSEWPC 2013).

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Legend
Project area
South Coast Significant Wetlands (DBCA-018)
Conservation Class

Scale: 1:15,000 at A4
0 100 200
metres

Coord. Sys. GDA2020 MGA Zone 50

Job Number: 62664

Client: CLE Town Planning and Design

Version: A | Date: 01-Sep-2022

Drawn By: cthatcher | Checked By: NM

GEOMORPHIC WETLANDS

FIGURE 3.3

strategen JBS&G

File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\Rowe\62317 Woolstores Pl Structure Plan Env Studies\GIS\Maps\R01\62317_Woolstores_Pl_R01_V1.aprx
Image Reference: World Imagery: Maxar www.nearmap.com© - Imagery Date: 3 June 2022.

3.6 Contamination

The CS Act defines contamination as 'having a substance present in land or water above background concentrations that presents a risk of harm to human health or the environment.' The CS Act also provides for the identification, recording, management, and remediation of contaminated sites. Contamination commonly occurs through accidental leakage and spillage and/or poor site management practices.

Contaminated sites were in the immediate vicinity of the site, that were identified from a desktop search of the DWER Online Contaminated Sites Database and are spatially indicated in Figure 3-8.

JBS&G were engaged to undertake a preliminary site investigation (PSI) of the site, "JBS&G - Preliminary Site Investigation – Woolstores Place, 2022". The scope of that investigation is as follows:

- Completion of a PSI to identify potentially contaminating activities including but not limited to the observation of the following:
    - Location and condition of visible features including foundations, tanks, pits, wells and bores.
    - Chemical storage and transfer areas, including the presence of waste or chemical containers.
    - Suspect or known hazardous building materials in site structures.
    - Assessment of areas fly tipping/ waste disposal.
    - Observations of obvious evidence of hazardous materials/ conditions (evidence of surface staining, pits, ponding, stressed vegetation, etc.).
- Completion of a desktop review of available client provided and publicly available information including, but not limited to:
    - Local topography, geology, hydrology, hydrogeology and meteorological data (i.e., environmental setting).
    - Historical aerial photographs, including a review of previous and current site activities.
    - Current and historical land title search, including a review of the historical owners and occupiers of the site.
    - Drainage at the site.
    - Readily available government/council records
    - Any dangerous goods records from the DMIRS.
    - DWER records on the contamination classification of the site.

Preparation of an interpretative PSI report, including an updated Conceptual Site Model (CSM), in general conformance with the WA DWER Contaminated Sites Guidelines (2014), National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013 (NEPM), relevant Australian Standards (e.g., AS4482.1, AS4482.2) and industry standards. The Potential Pollution Linkages are presented in Table 3-5.

The key findings of the PSI are as follows:

Former Site Structures and Stockpiled Soil

The site investigation included an assessment for Potentially Asbestos Containing Material (PACM) associated with demolition and dilapidation of former site structures and stockpiled soils. Fragments of PACM were observed at multiple locations during the site inspection. The presence of PACM fragments presents a potentially unacceptable health risk to future residents and construction workers, as well as an aesthetic risk. The potential for fibre generation during civil works also poses a risk to on-site receptors.

Stockpiled soil was also present throughout the site. Stockpiled soil on the site was observed to contain a combination of building rubble, sheet metal, steel and PACM.

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Illegal Dumping/ Fly Tipping

Along the eastern portion of the site, illegal dumping/ fly tipping was observed. Fragments of PACM were observed at multiple locations during the site inspection. The presence of PACM fragments and other COPCs associated with fly tipping (metal pipes, steel framework, sheet metal, concrete, paint tins, bricks, tyres etc.) presents a potentially unacceptable health risk to future residents and construction workers, as well as an aesthetic risk.

Potential Uncontrolled Fill

The site has been built on reclaimed land. There is a potential risk associated with the unknown nature and extent of the imported material. During the preliminary site investigation, PACM fragments were observed within the fill material that was used to create site levels as they are today. The uncontrolled fill presents a potentially unacceptable health risk to future residents and construction workers, as well as an aesthetic risk.

At the time of inspection, a limestone road base had been imported to assist with site levels off-site. The limestone road base originated from virgin quarry material . As the material has been directly sourced from a quarry, the potential for contamination from this material to migrate on-site is considered negligible. It should be noted that the imported limestone clean fill is located outside of the LSP boundary.

Historical Land Uses

The site has been subject to commercial/ industrial land uses for roughly 70 years. There is potential for site wide contamination associated with these historical potentially contaminating activities to exist. The site while operational was used as a wool storage facility with truck and machinery access. During the PSI, soak wells were observed but the linings were unable to be visually assessed. Further assessment to determine whether the soak wells are lined or unlined is required. Most of the site is also unsealed creating a potential pathway for contaminants from onsite activities to leach through the soil profile to impact groundwater.

Migration of potentially contaminated groundwater from up-gradient properties

Various up-gradient properties were identified that are impacted by contaminated groundwater. Based on the information reviewed, it is possible that these impacts have migrated on-site. General regional groundwater quality is known to be acidic. As future land uses on-site are proposed to be a combination of residential and mixed commercial uses, there is a risk that site receptors may come into contact with this contaminated groundwater if abstracted for use. Groundwater in the local area is also relatively shallow (<2 mbgl).

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Table 3-5: Updated Potential Pollution Linkages

APEC	Receptor	Exposure Pathway	Linkage Status	Justification
1.Contamination associated with the former site structures and stockpiled soils. COPC • ACM • TRH • BTEX • PAH • VOC/sVOC • Metals	**Onsite -** future site visitors and residents.	Dermal contact and incidental ingestion of soil and/or groundwater.	Possible	Stockpiled soils were observed on Lot 1104 and off-site (north of Lot 11 and Lot 140 – not included in this investigation). The nature and extent of potential contamination within the stockpiled soil on Lot 1104 is currently unknown. Risks to onsite workers, visitors and residents via dermal contact of soil is possible. The leaching of potential contaminants associated with the stockpiled soils can possibly migrate to groundwater. Dermal contact of groundwater for site visitors and residents on-site will only be possible through groundwater abstraction. Dermal contact of groundwater for on-site site visitors and residents is considered highly unlikely as there are no current abstraction bores on-site. It is highly unlikely that a bore will be installed in the future due to the saline nature of the groundwater.
		Inhalation of dust and fibres	Possible	There is a possibility that wind can generate dust off the stockpiles and therefore mobilise the identified stockpiles COPC, creating unacceptable risks to future on-site workers, visitors and residents via dust inhalation. The preliminary site investigation identified PACM within Lot 1104, 1209, 895 and 1350. The presence of PACM fragments in these areas present a potentially unacceptable health risk to future residents, workers and site visitors, including an aesthetic risk. **Qualitative Risk Rating: Moderate**
	Onsite - intrusive maintenance and civil contractors	Dermal contact and incidental ingestion of soil and/or groundwater.	Possible	Stockpiled soils were observed on Lot 1104 and off-site (north of Lot 11 and Lot 140 – not included in this investigation). The nature and extent of potential contamination within the stockpiled soils is currently unknown. Risks to intrusive maintenance workers and civil contractors via dermal contact of stockpiled soil is possible. The leaching of potential contaminants associated with the stockpiled soils can possibly migrate to groundwater. As groundwater at the site is shallow, intrusive maintenance workers and civil contractors may encounter potentially contaminated groundwater.
		Inhalation of dust and fibres	Possible	There is a possibility that future civil works generate dust and therefore mobilise the identified stockpiles COPC, creating unacceptable risks to intrusive maintenance and civil contractors via dust inhalation. The preliminary site investigation identified PACM within Lot 1104, 1209, 895 and 1350. Excavation activities (particularly during development) could result in significant disturbance of PACM and potential for generation of fibres if not appropriately managed. **Qualitative Risk Rating: Moderate**

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	Onsite – Ecological Receptors	Uptake by roots	Possible	Vegetated areas for the current (general industry and rural residential) and future (mixed use) land uses are considered to be low ecological significance. No signs of vegetation stress were observed during the preliminary site investigation. **Qualitative Risk Rating: Low**
	Offsite - human receptors including recreational users of the Royal Princess Harbour	Dermal contact and incidental ingestion of groundwater.	Unlikely	Stockpiled soils were observed on Lot 1104 and off-site (north of Lot 11 and Lot 140 – not included in this investigation). The nature and extent of potential contamination within the stockpiled soils is currently unknown. There is a possibility (unlikely) that potentially impacted soils may leach into groundwater and then migrate off-site where recreational users of the marine environment may be exposed via dermal contact and incidental ingestion. The closest groundwater abstraction bore is 1.2 km cross-gradient (west) of the site, it is therefore considered that potential contaminants from the site present in groundwater (if present) will not impact the human receptors abstracting water from the bore.
		Inhalation of dust and fibres	Possible	There is a possibility that future civil works and wind generate dust and therefore mobilise the identified stockpiles COPC, creating unacceptable risks to off-site human receptors via dust inhalation. The preliminary site investigation identified PACM within Lot 1104, 1209, 895 and 1350. Development activities would result in significant disturbance of soils and possible generation of fibres which may impact offsite receptors if not appropriately managed. **Qualitative Risk Rating: Low**
	Offsite - Ecological Receptors	Direct Contact	Unlikely	The Royal Princess Harbour is the closest down-gradient ecological receptor to the site. The Royal Princess Harbour is located along the southern boundary of the site. Leaching of contaminants within the stockpiled material to groundwater and subsequent off-site migration is possible, although unlikely, and could pose risks to the sensitive ecological receptors (if reported above ecological criteria) within the Harbour. **Qualitative Risk Rating: Low**
2. Illegal dumping/ Fly tipping activities COPC • ACM • TRH • BTEX • PAH	**Onsite** - future site visitors and residents.	Dermal contact and incidental ingestion of soil and/or groundwater.	Possible	During the site inspection, fly tipping was observed in areas of cleared land, primarily located in the eastern portion of the site. The nature and extent of this fly tipping is currently unknown but is comprised mainly of steel structures, metal sheeting and wire, concrete, rubble, concrete pipes etc. It is possible that fly tipping may have resulted in contamination to the underlying soils. If disturbance works are completed on the material, there is possibility for residents, on-site workers and visitors to be exposed to contaminants. Fly tipping also represents an aesthetic risk. Potential groundwater impacts through leaching are unknown but are considered unlikely.

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• VOC/sVOC •Metals		Inhalation of impacted dusts/fibres	Possible	PACM along with other COPCs were observed in association with the fly tipping observed on-site. It is possible that fly tipping may have resulted in contamination to the underlying soils. Therefore, future civil works that generate dust and therefore mobilise the identified COPC, can creating unacceptable risks on-site future workers, site visitors and residents via dust and fibre inhalation. **Qualitative Risk Rating: Low**
	Onsite - intrusive maintenance and civil contractors	Uptake by roots	Unlikely	Vegetated areas for the current (general industry and rural residential) and future (mixed use) land uses are considered to be low ecological significance. No signs of vegetation stress were observed during the preliminary site investigation. **Qualitative Risk Rating: Low**
	Offsite - Current and future off-site workers and residents	Inhalation of impacted dusts/fibres	Possible	During the site inspection, fly tipping was observed in areas of cleared land, primarily located in the eastern portion of the site. The nature and extent of this fly tipping is currently unknown but is comprised mainly of steel structures, metal sheeting and wire, concrete, rubble, concrete pipes etc. On-site civil works and wind can mobilise contaminants and PACM associated with fly tipping, it is possible for contaminants to pose a risk to off-site site workers and residents.
		Dermal contact and incidental ingestion groundwater.	Unlikely	The current nature and extent of contaminants associated with fly tipping is unknown, therefore, potential groundwater impacts through leaching are unknown. Dermal contact and incidental ingestion of potentially contaminated groundwater for future off-site workers and residents is considered unlikely as there are no down gradient off-site residents or site workers. The closest groundwater abstraction bore is 1.2 km cross-gradient (west) of the site, it is therefore considered that potential contaminants from the site present in groundwater will not impact the human receptors abstracting water from the bore. **Qualitative Risk Rating: Low**
	Offsite – recreational users of the Royal Princess Harbour	Inhalation of impacted dusts/fibres	Possible	During the site inspection, fly tipping was observed in areas of cleared land, primarily located in the eastern portion of the site. The nature and extent of this fly tipping is currently unknown but is comprised mainly of steel structures, metal sheeting and wire, concrete, rubble, concrete pipes etc. On-site civil works and wind can mobilise contaminants and PACM associated with fly tipping, it is possible for contaminants to pose a risk to off-site recreational users of the Royal Princess Harbour.
		Dermal contact and incidental ingestion of groundwater.	Unlikely	Potential contaminants associated with onsite fly tipping are unknown. Contaminated groundwater on-site associated with the leaching of COPC from fly tipping could migrate off-site and be expressed as surface water in Princess Harbour. Ingestion of this contaminated groundwater by recreational users (now expressed as surface water) is unlikely.

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				Qualitative Risk Rating: Low
	Offsite – Ecological Receptors	Direct Contact	Unlikely	The Royal Princess Harbour is the closest down-gradient ecological receptor to the site. The Royal Princess Harbour is located along the southern boundary of the site. Leaching of contaminants within the fly tipping material to groundwater and subsequent off-site migration is possible, although unlikely, and could pose risks to the sensitive ecological receptors (if reported above ecological criteria) within the Harbour. **Qualitative Risk Rating: Low**
3. Potential uncontrolled fill COPC • Asbestos • TRH • BTEX • PAH • VOC/sVOC •Metals	**Onsite -** future site visitors and residents.	Dermal contact and incidental ingestion of soil and/or groundwater. Inhalation of impacted dusts/fibres	Possible Possible	Review of historical aerial imagery at the site identified the potential for uncontrolled fill placement prior to, and during, development of the Woolstores site. During the site inspection it was noted that the site was generally flat, and slopes to the south towards Princess Royal Harbour. The Woolstores warehouses have been built on top of the reclaimed land. The imported material was observed to contain PACM along with other rubble. At the time of inspection, the off-site northern rural residential properties had been cleared of most vegetation and site structures (residential houses). A limestone road base was imported to assist with site levels. The origin of this limestone road base is from the Great Southern Region Quarry Pits. The quarry certificates are presented in Appendix G and does not pose any risks to receptors. The areas that have been subject to imported fill (the material under the Woolstores warehouses) could potentially pose risks via direct contact, dust and fibre inhalation, although the nature and extent of contamination is currently unknown. As the nature and extent of contaminants associated with the potential uncontrolled fill is currently unknown, potential groundwater impacts through leaching are possible. Dermal contact of groundwater for site visitors and residents on-site will only be possible through groundwater abstraction. Dermal contact of groundwater for on-site site visitors and residents is considered highly unlikely as there are no current abstraction bores on-site. It is also highly unlikely that a bore will be installed in the future due to the saline nature of the groundwater. **Qualitative Risk Rating: Low/Moderate**
	Onsite - intrusive maintenance and civil contractors	Inhalation of impacted dusts/fibres. Dermal contact and incidental ingestion of soil and/or groundwater.	Possible Possible	Review of historical aerial imagery at the site identified the potential for uncontrolled fill placement prior to, and during, development of the site. During the site inspection it was noted that the site was generally flat, and slopes to the south towards Princess Royal Harbour. The Woolstores warehouses have been built on top of the reclaimed land. The imported material was observed to contain PACM along with other rubble. At the time of inspection, the off-site northern rural residential properties had been cleared of most vegetation and site structures (residential houses). A limestone road base was imported to assist with site levels. The origin of this limestone road base is from the Great Southern Region Quarry Pits. The quarry certificates are presented in Appendix G and does not pose any risks to receptors. The areas that have been subject to imported fill (the material under the warehouses) could potentially pose risks via

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			direct contact and fibre inhalation, when civil works begin or general intrusive maintenance works. The current nature and extent of contaminants associated with the imported fill is currently unknown, therefore, potential groundwater impacts through leaching of the potentially contaminated soil are unknown but could pose risks to future onsite intrusive maintenance and civil contractors (groundwater assumed to be less than 2 mbgl). **Qualitative Risk Rating: Low/Moderate**
Onsite – Ecological Receptors	Uptake by roots	Possible	Vegetated areas for the current (general industry and rural residential) and future (mixed use) land uses are considered to be low ecological significance. No signs of vegetation stress were observed during the preliminary site investigation. **Qualitative Risk Rating: Low**
Offsite - Current and future off-site workers and residents	Inhalation of impacted dusts/fibres	Possible	It is possible for dust to be generated during future excavation and earthworks of material on-site. PACM was observed within the fill material present on the Woolstores lots. There are surrounding residential and industrial properties that may be at risk from impacted dusts/ fibres once airborne.
	Dermal contact and incidental ingestion of groundwater.	Unlikely	a potential pathway link via leaching of contaminants within the fill to offsite receptors. As groundwater flow direction is to the south (Princess Harbour), the likelihood of exposure to off-site site workers and residents is unlikely Potential contaminants present in the fill material on site are unknown. Groundwater is present between roughly 0 – 2 mbgl. **Qualitative Risk Rating: Low**
Offsite – recreational users of the Royal Princess Harbour	Inhalation of impacted dusts/fibres	Possible	On-site civil works and wind can mobilise contaminants and PACM associated with fly tipping, it is possible for contaminants to pose a risk to off-site recreational users of the Royal Princess Harbour.
	Dermal contact and incidental ingestion of groundwater.	Unlikely	Contaminated groundwater on-site associated with the leaching of COPC from the imported fill could migrate off-site and be discharged to surface water in Princess Harbour. Contact with contaminated groundwater by recreational users is unlikely. **Qualitative Risk Rating: Moderate**
Offsite – Ecological Receptors	Direct Contact	Possible	The Royal Princess Harbour is the closest down-gradient ecological receptor to the site. The Royal Princess Harbour is located along the southern boundary of the site. Leaching of contaminants within the fly tipping material to groundwater and subsequent off-site migration is possible, although unlikely, and could pose risks to the sensitive ecological receptors (if reported above ecological criteria) within the Harbour. **Qualitative Risk Rating: Moderate**

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4. Historical land uses of the site. COPC • TRH • BTEX • PAH • VOC/sVOC • OCP/OPP •Metals •Asbestos	**Onsite** - Current and site visitors and residents.	Dermal contact and incidental ingestion of soil and/or groundwater.	Possible	The historical operation of the Woolstores lots as industrial since the 1950s and rural residential land uses in the remaining lots has the potential to cause contamination. Historical aerials suggest that the site has been predominantly unsealed including at the time of this investigation. Potential hydrocarbons, pesticides and heavy metals could be present through the unsealed soil profile and groundwater onsite. The on-site drain network present on the Woolstores lots could act as a potential pathway for contaminated soils to leach into groundwater on-site. The northern rural residential lots, although undeveloped, have the potential to be the source of contamination. No visual or olfactory contamination was observed at the rural residential lots at the time of inspection, although, this does not discount the possibility of contamination being present. As the nature and extent of contaminants associated with the historical land uses is currently unknown, potential groundwater impacts through leaching are possible. Dermal contact of groundwater for site visitors and residents on-site will only be possible through groundwater abstraction. Dermal contact of groundwater for on-site site visitors and residents is considered highly unlikely as there are no current abstraction bores on-site. It is also highly unlikely that a bore will be installed in the future due to the saline nature of the groundwater.
			Unlikely	
		Inhalation of vapours		Potential hydrocarbon contamination in the soil profile can also migrate via leaching into groundwater and may represent a risk to human receptors via vapour inhalation. Although, no hydrocarbon staining or contamination was observed, therefore, the risk of this is considered low.
			Possible	
		Inhalation of fibres		Historical building structures (PACM roofing panels) were observed during the site inspection, although were in the process of being removed. There is still a possibility that fugitive PACM fragments will exist in the surrounding soil once the roofing panels have been removed. **Qualitative Risk Rating: Low**
	Onsite - intrusive maintenance and civil contractors	Dermal contact and incidental ingestion of soil and/or groundwater.	Possible	The historical operation of the Woolstores lots as industrial since the 1950s and rural residential land uses in the remaining lots has the potential to cause contamination. Historical aerials suggest that the site has been predominantly unsealed including at the time of this investigation. Potential hydrocarbons, pesticides and heavy metals could be present through the unsealed soil profile and groundwater onsite. The on-site drain network present on the Woolstores lots could act as a potential pathway for contaminated soils to leach into groundwater on-site. No visual or olfactory contamination was observed at the rural residential lots at the time of inspection, although, this does not discount the possibility of contamination being present.

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		Inhalation of vapours	Possible	As the nature and extent of contaminants associated with the historical land uses is currently unknown, potential groundwater impacts through leaching are possible and pose risks to intrusive maintenance workers and civil contractors (groundwater assumed to be less than 2 mbgl). Based on the depth to groundwater, intrusive workers could potentially come into contact with groundwater at the site. The current nature and extent of contaminants associated with the historical industrial land use is currently unknown, therefore, potential groundwater impacts through leaching are unknown but could pose risks to future onsite intrusive maintenance and civil contractors (groundwater assumed to be less than 2 mbgl). If present, vapours have the potential to accumulate in trenches and excavations posing unacceptable risks to intrusive maintenance workers and civil contractors. Historical building structures (PACM roofing panels) were observed during the site inspection, although were in the process of being removed. There is still a possibility that fugitive PACM fragments will exist in the surrounding soil once the roofing panels have been removed. This PACM material (if present) will pose risks to onsite intrusive maintenance and civil contractors via fibre inhalation. **Qualitative Risk Rating: Low**
		Inhalation of fibres	Possible	
	Onsite – Ecological Receptors	Uptake by roots	Possible	Vegetated areas for the current (general industry and rural residential) and future (mixed use) land uses are considered to be low ecological significance. No signs of vegetation stress were observed during the preliminary site investigation. **Qualitative Risk Rating: Low**
	Offsite - human receptors including residents and recreational users of the Royal Princess Harbour	Dermal contact and incidental ingestion of groundwater.	Unlikely	Potential contaminants associated with the historical industrial land use of the Woolstores lots are unknown. Potentially contaminated soils on-site could possibly leach into the shallow groundwater and migrate down gradient to the Princess Harbour and become expressed as surface water. Dermal contact and incidental ingestion of potentially contaminated groundwater (expressed as surface water) for recreational receptors in the Royal Princess Harbour is considered possible but unlikely.
		Inhalation of dust and fibres	Possible	It is possible for contaminated dust and PACM fibres to be generated during future excavation, earthworks and wind. Surficial PACM was observed throughout the Woolstores lots. There are surrounding residential and industrial properties that may be at risk from impacted dusts/ fibres if airborne. Recreational users of the Royal Princess Harbour could potentially be at risk from fibres and dust generated from wind and during future excavation and earthworks of material onsite. **Qualitative Risk Rating: Low**

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	Offsite - Ecological Receptors	Direct Contact	Possible	The Royal Princess Harbour is the closest down-gradient ecological receptor to the site. The Royal Princess Harbour is located along the southern boundary of the site. Leaching of contaminants within the soil to groundwater and subsequent off-site migration is possible, although unlikely, and could pose risks to the sensitive ecological receptors (if reported above ecological criteria) within the Harbour. **Qualitative Risk Rating: Low**
5. Migration of contaminated groundwater from up-gradient properties COPC • pH •Metals	**Onsite** - Current and future on-site workers, site visitors and residents.	Dermal contact and incidental ingestion of groundwater.	Possible	There are various properties to the north of the site that have been classified as Remediated for Restricted Use (commercial/ industrial). Groundwater from these up-gradient properties have reported acidic conditions and contain elevated concentrations of metals (aluminium, iron, copper and zinc). The acidic groundwater conditions are thought to be representative of regional conditions, although, elevated concentrations of metals are associated with the contaminating activities from the up-gradient classified sites. There is no evidence to confirm that these impacts have migrated off-site (creating a 'source site'). If these impacts were to migrate off-site and come on-site, dermal contact and ingestion of water would only be possible through groundwater abstraction. Dermal contact of groundwater for on-site site visitors and residents is considered highly unlikely as there are no current abstraction bores on-site. It is also highly unlikely that a bore will be installed in the future due to the saline nature of the groundwater. **Qualitative Risk Rating: Low**
	Onsite intrusive maintenance and civil contractors	Dermal contact and incidental ingestion of groundwater.	Possible	There are various properties to the north of the site that have been classified as Remediated for Restricted Use (commercial/ industrial). Groundwater from these up-gradient properties have reported acidic conditions and contain elevated concentrations of metals (aluminium, iron, copper and zinc). However, a review of groundwater data from across the catchment area indicates that the levels of nutrients, acidity, and metals in groundwater beneath this site are indicative of background up-hydraulic gradient groundwater quality. There is no evidence to confirm that these impacts have migrated off-site (creating a 'source site'). Groundwater on-site could potentially be intersected by regular maintenance activities and therefore may present unacceptable risks for intrusive maintenance workers.. **Qualitative Risk Rating: Moderate**
	Onsite – Ecological Receptors	Uptake by roots	Possible	Vegetated areas for the current (general industry and rural residential) and future (mixed use) land uses are considered to be low ecological significance. No signs of vegetation stress were observed during the preliminary site investigation. **Qualitative Risk Rating: Low**

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Legend

Project area

Soil Landscape Mapping - Systems (DPIRD-064)

Mount Manypeaks System

Torbay System

Topographic contours (mAHD)

Scale: 1:7,000 at A4

0 50 100 metres

Coord. Sys. GDA2020 MGA Zone 50

Job Number: 62317

Client: Rowe Group

Version: A

Date: 01-Sep-2022

Drawn By: cthatcher

Checked By: NM

TOPOGRAPHY AND SOIL TYPES

FIGURE 3.4

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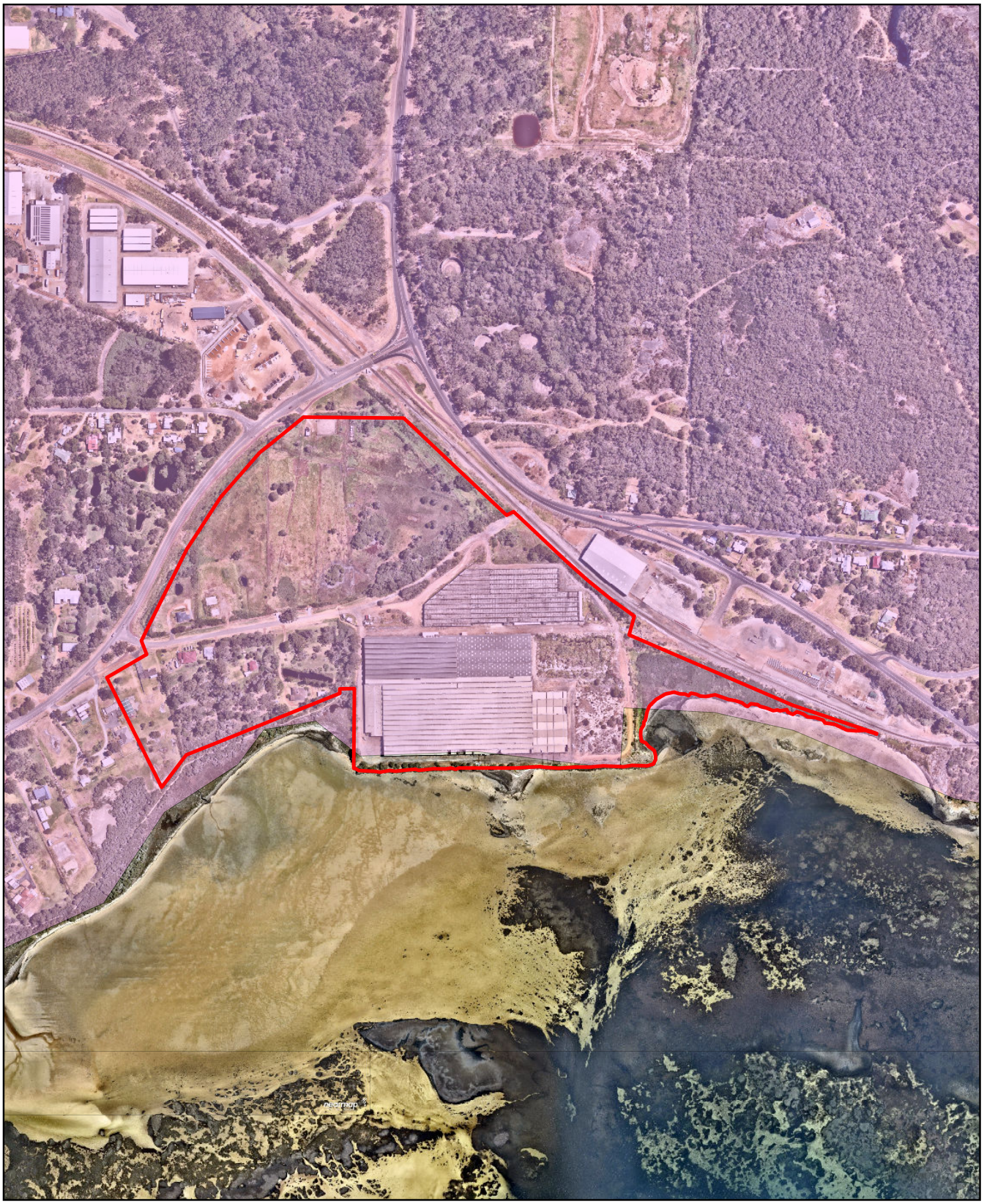
File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\Rowe\62317 Woolstores Pl Structure Plan Env Studies\GIS\Maps\R01\62317_Woolstores_Pl_R01_V1.aprx
Image Reference: www.nearmap.com© - Imagery Date: January 2022.



Legend

- Project area
- Cadastre (LGATE-002)
- 1:500 000 State interpreted bedrock geology (DMIRS-016)
  - P_-jmgnn-mog-KKBN; Nornalup Zone metagranitic unit; Granitic gneiss interlayered with metagabbro; may include intrusions of Recherche and Esperance Supersuites

Scale: 1:7,000 at A4	0 50 100 metres	
Coord. Sys. GDA2020 MGA Zone 50		**GEOLOGY**
Job Number: 62317		
Client: Rowe Group		**FIGURE 3.5**
Version: A	Date: 01-Sep-2022	strategen JBS&G
Drawn By: cthatcher	Checked By: NM	

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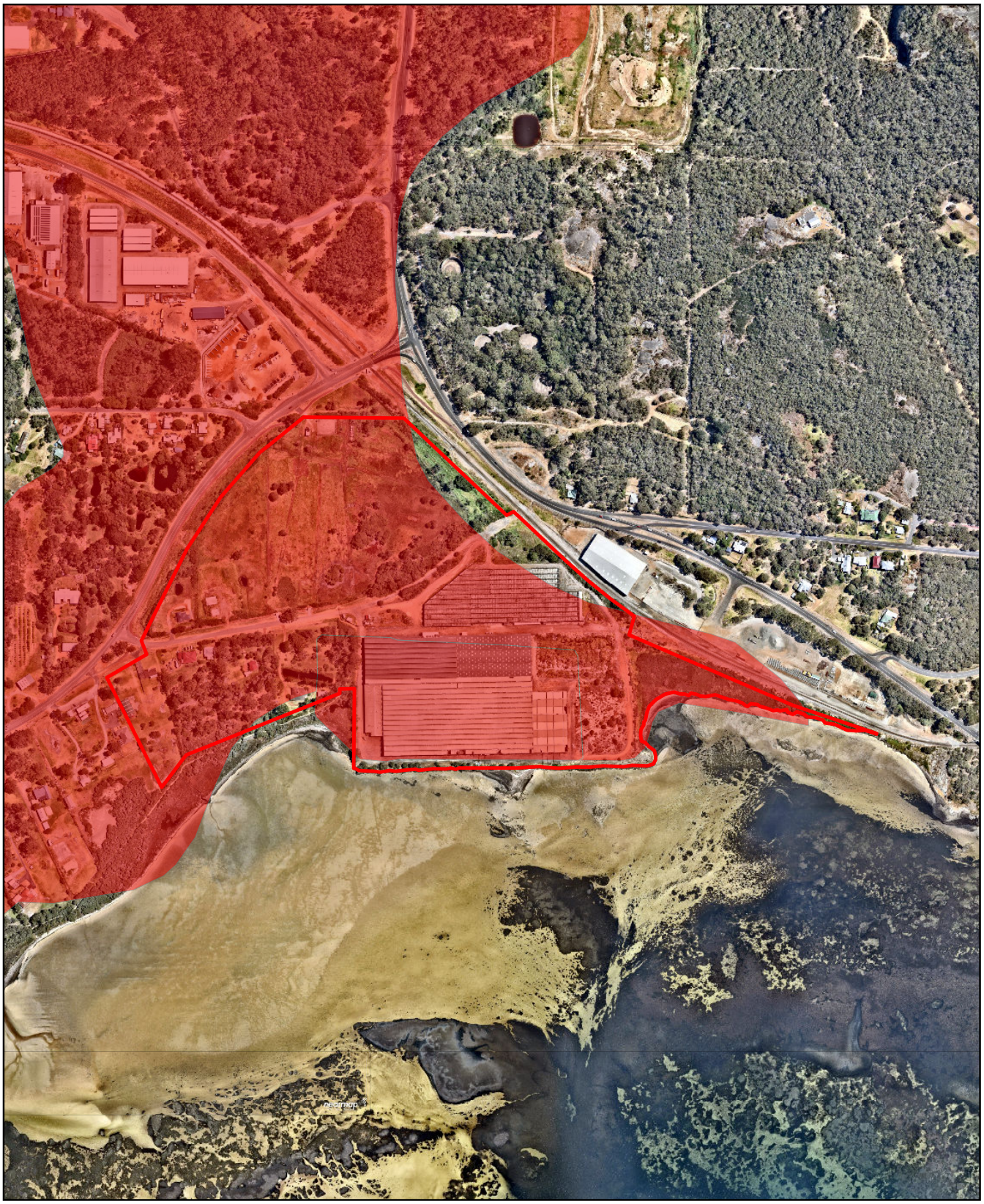
Image Reference: www.nearmap.com© - Imagery Date: January 2022.



Legend

- Project area
- Cadastre (LGATE-002)

Acid Sulfate Soil Risk Map, Albany-Torbay (DWER-054)

- 1 - High to moderate risk of ASS occurring within 3m of natural soil surface
- Major road
- Minor road
- Track

Scale: 1:7,000 at A4

0 50 100
metres

Coord. Sys. GDA2020 MGA Zone 50

Job Number: 62317

Client: Rowe Group

Version: A

Date: 01-Sep-2022

Drawn By: cthatcher

Checked By: NM

ACID SULFATE SOIL RISK MAPPING

FIGURE 3.6

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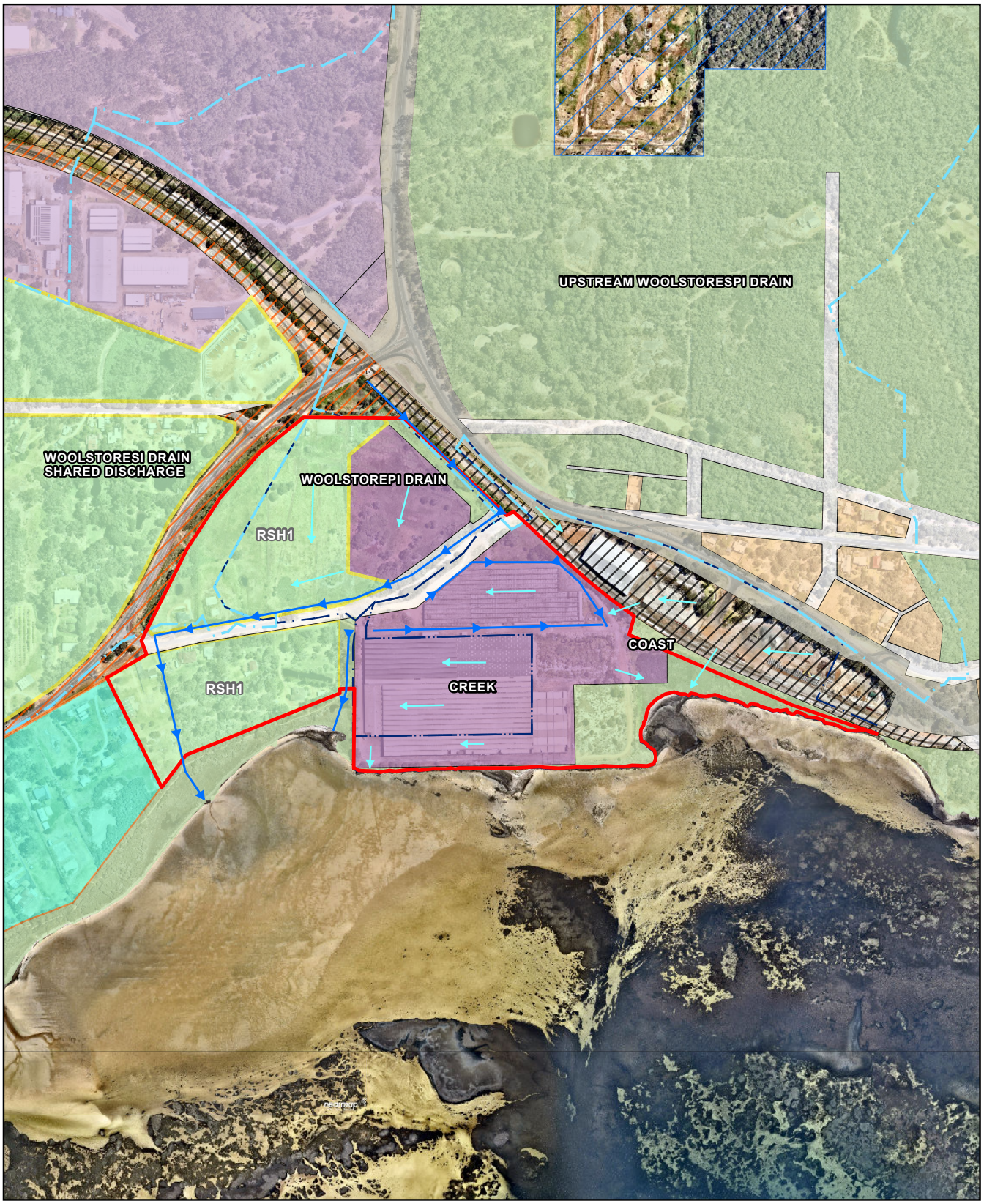
Image Reference: www.nearmap.com© - Imagery Date: January 2022.



Legend

- Project area
- Site catchment
- External catchment

Local Planning Scheme - Zones and Reserves (DPLH-071)

- General industry
- Light industry
- Local road
- Major road
- Parks and recreation
- Priority road
- Public use
- Rail
- Residential
- Rural small lot holdings
- Tourist residential
- Existing drains/creeks/pipes
- Surface flow path

Scale: 1:7,000 at A4 (0 50 100 metres)

Coord. Sys. GDA2020 MGA Zone 50

Job Number: 62317

Client: Rowe Group

Version: A | Date: 01-Sep-2022

Drawn By: cthatcher | Checked By: NM

DRAINAGE NETWORKS AND CATCHMENT

FIGURE 3.7

strategen JBS&G

File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\Rowe\62317 Woolstores PI Structure Plan Env Studies\GIS\Maps\R01\62317_Woolstores_PI_R01_V1.aprx
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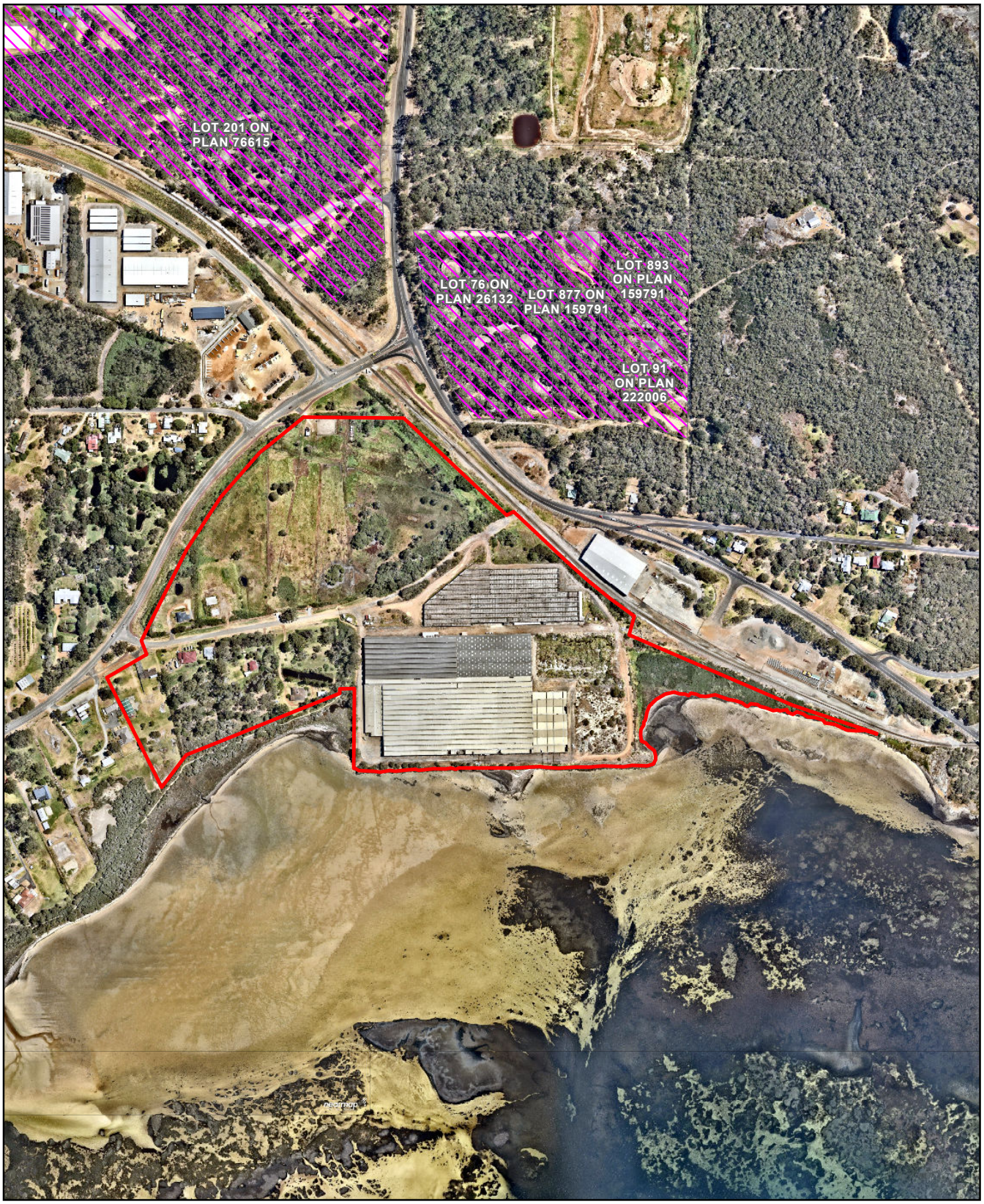

Legend

Project area

Contaminated sites database (DWER-059)

Remediated for restricted use

Scale: 1:7,000 at A4

0 50 100 metres

Coord. Sys. GDA2020 MGA Zone 50

Job Number: 62317

Client: Rowe Group

Version: A

Date: 01-Sep-2022

Drawn By: cthatcher

Checked By: NM

REGISTERED CONTAMINATED SITES

FIGURE 3.8

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3.7 Flora & Vegetation

3.7.1 Survey Effort

A preliminary ecological assessment was undertaken on 15 December 2022 by a JBS&G Associate Ecologist with over 15 years of experience conducting ecological assessment in the south-west bioregion. A site walkover was carried out to visually inspect key features of the site, with a focus on identifying requirements for further ecological survey and any vegetation potentially representative of the Subtropical and Temperate Coastal Saltmarsh ecological community.

A reconnaissance flora and vegetation survey was subsequently undertaken by JBS&G (2024) from 25-27 October 2023 over the site and adjacent lands where access was permitted and could be safely achieved (the Survey Area). The Survey Area was traversed predominantly on foot, with an attempt made to visit all vegetation units based on observations of aerial photography.

Several portions of the site could not be thoroughly inspected due to boundary obstruction (both temporary and permanent structures) or for safety reasons; however the majority of the site allowed for general visual overview. A visual inspection of existing lots 52, 53 and 54 from outside the northern and southern boundaries was also made, to see if any indicative information on broad vegetation units present could be gleaned (JBS&G 2024).

3.7.2 Pre-European Vegetation

The National Objectives and Targets for Biodiversity Conservation 2001 - 2005 recognises that a retention of 30% or more of the pre-clearing extent of each ecological community is necessary if Australia's biological diversity is to be protected (ANZECC 2000).

Under Position Statement No. 2, it is considered that any vegetation association with less than 10% of its pre-clearing extent be considered threat classification of 'Endangered.'

Shephard et al. (2001) mapped the extent of pre-European vegetation across Western Australia, with recent updates reflecting the National Vegetation Information System (NVIS) Standards.

A single vegetation association has been mapped across the site: Albany 3. The pre-European and current extent of this vegetation association is available from the State-wide Vegetation Statistics Dataset (Government of Western Australia (GoWA) 2019) and is presented in Table 3-6.

More than 30 % of the pre-European extent of Albany – 3 remains at a local and regional scale.

Table 3-6: Vegetation Associations (JBS&G 2024)

Vegetation Sub-Association	Scale	Pre-European Extent (ha)	Current Extent (ha)	% Remaining
Albany - 3 Medium forest; jarrah-marri	Western Australia	2,661,404.62	1,803,437.48	67.76
	Jarrah Forest IBRA Region	2,390,591.54	1,604,101.56	67.10
	Southern Jarrah Forest IBRA Sub-region	1,482,491.85	880,655.65	59.40
	City of Albany	50,509.32	16,024.66	31.73

3.7.3 Vegetation Types

Six vegetation units were identified within the site. The majority of these were dominated by weed taxa and poorly defined. Only three were considered to be of adequate condition to justify relevé assessment and of these, the Juncus pallidus closed sedgeland was inaccessible at the time of survey (JBS&G, 2024).

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Table 3-7: Vegetation Types within the site

Vegetation Types	Area (ha)	Proportion of Survey Area	Photo
Juncus pallidus closed sedgeland over sparse mixed weeds and *Threlkeldia diffusa*	0.22	1.30%	
Melaleuca rhaphiophylla closed woodland over patches of *Taxandria juniperina*, over sparse forbland of *Isolepis prolifera, Microtis media, *Centella asiatica, *Zantedeschia aethiopica* and **Cotula coronopifolia* (Relevé 3)	0.26	1.53%	
Parkland cleared woodland of *Melaleuca rhaphiophylla* and *Agonis flexuosa* interspersed with **Salix babylonica* over *Pteridium esculentum* and mixed weed species	0.73	4.33%	

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Tall shrubland of **Acacia longifolia, *Gaudium laevigatum* and ?**Syzygium smithii* with patches of emergent *Agonis flexuosa* over **Cenchrus clandestinus,* mixed weeds and isolated *Anigozanthos viridis*	0.22	1.32%	
Woodland of *Eucalyptus cornuta* and **Eucalyptus globulus* over *Agonis flexuosa*, over *Pteridium esculentum, *Stenotaphrum secundatum, *Cenchrus clandestinus* and **Pelargonium capitatum* (Relevé 1)	0.28	1.66 ha	
Parkland cleared	6.76 ha	44.33%	

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Unvegetated	8.30	49.53%	
Total	**16.77**		

3.7.4 Vegetation Condition

Vegetation condition across the site was classified using condition scales developed by Keighery (1994) as outlined in Table 3-8(JBS&G, 2024).

Table 3-8: Condition Rating Categories (Keighery 1994)

Condition	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.
Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging, and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback, and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback, and grazing.
Completely Degraded	The structure of the vegetation is no longer intact, and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.

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The site is mainly comprised of cleared paddocks, access roads, fences, and other man-made structures including residential houses and large industrial buildings. As such, the majority of vegetation present is anticipated to be characterised as parkland cleared and classified as 'Completely Degraded' (Table 3-9).

Table 3-9: Vegetation condition (JBS&G 2024)

Condition	Area (ha)	Proportion of Survey Area	Condition
Completely Degraded	16.29	97.02%	Completely Degraded
Good	0.03	0.16%	Good
Very Good	0.47	2.82%	Very Good
Total	16.79		Total

Several pockets of fragmented vegetation remain within the Survey Area, including some vegetation close to the shoreline as shown in Figure 3-8. This vegetation is anticipated have some level of degradation due to the impacts of land clearing and weed invasion.

3.7.5 Conservation Significant Communities

During the field survey, saltmarsh vegetation aligning with key criteria of the Subtropical and Temperate Coastal Saltmarsh TEC was observed within the site boundary, on lower-lying coastal shores to the south-southwest and southeast of the site. This patch was contiguous with saltmarsh vegetation outside the site, amounting to approximately 1 ha (greater than the minimum patch size of 0.4 ha). The patch contained <50% weeds, meeting the minimum condition thresholds (JBS&G, 2024).

This TEC occurs in coastal areas under regular or intermittent tidal influence. In southern latitudes saltmarsh is often the main vegetation-type in the intertidal zone, consisting mainly of salt-tolerant vegetation (halophytes) including grasses, herbs, sedges, rushes and shrubs, and it commonly occurs in association with estuaries (DSEWPaC 2013). The TEC is mainly associated with sandy or muddy shores of estuaries and embayments and on some open, low wave energy coasts. It is characterised by some form of tidal connection and inundation, with most areas draining fully on the ebb tide, but intermittently or rarely-inundated supratidal areas may be incorporated. The community is inhabited by a wide range of infaunal and epifaunal invertebrates, and low-tide and high-tide visitors such as prawns, fish and birds. It often constitutes important nursery habitat for fish and prawn species (DSEWPC 2013).

The key threats to the Subtropical and Temperate Coastal Saltmarsh TEC include clearing and fragmentation; infill; altered hydrology/tidal restriction; invasive species; recreation; pollution and litter from stormwater; eutrophication; acid sulphate soils and insect control methods.

Other areas of vegetation within the LSP boundary were not found to overtly exhibit any key characteristics of the Subtropical and Temperate Coastal Saltmarsh TEC, or any other listed ecological community reported from the desktop study (JBS&G, 2024; Appendix D).

3.7.6 Groundwater Dependent Vegetation

Much of the Survey Area would have had historic dependence on groundwater due to the high water table in and given its location in the riparian zone for Princess Royal Harbor; however, few native vegetation remnants remain on the site. Saltmarsh and Melaleuca woodland should both be treated as having groundwater dependence (JBS&G, 2024).

3.7.7 Conservation-significant Flora

No flora listed as Threatened or Priority at a State or Commonwealth level were identified during the field surveys (JBS&G, 2024).

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3.7.8 Other Significant Flora

Tecticornia ?indica subsp. bidens, *Juncus ?krausii* and *Threlkeldia diffusa* were identified during the Biological Survey of the site. These species are associated with the listed TEC Subtropical and Temperate Coastal Saltmarsh (JBS&G, 2024).

3.8 Fauna

3.8.1 Survey Effort

A basic fauna survey was undertaken in accordance with EPA's (2020) Technical Guidance - Terrestrial vertebrate fauna surveys for environmental impact assessment (JBS&G, 2024).

This included an assessment of vegetation and soil associations and microhabitats present, and broad habitat mapping. Opportunistic fauna observations were be made during the habitat assessment.

Three camera traps were set between 25-28 October and bird surveys conducted throughout and on adjacent mudflats, over two consecutive mornings and afternoons. Targeted searching for signs of significant fauna was conducted throughout. Following identification of Western Ringtail Possums signs, a wider transect was searched to identify the species presence (JBS&G, 2024).

3.8.2 Fauna Assemblage

3.8.3 Conservation Significant Fauna

Two fauna taxa listed at a State or Commonwealth level were identified within the Survey Area, Western Ringtail Possum and Quenda. One additional listed taxon, the Forest Red-tailed Black Cockatoo was heard outside the Survey Area and ten bird species listed as Migratory and/or under an International Agreement were recorded in or adjacent to the Survey Area. One of these, the Fairy Tern is also listed as Vulnerable under the EPBC Act (JBS&G, 2024).

Western Ringtail Possum (*Pseudocheirus occidentalis*)

The Western Ringtail Possum is a small, arboreal mammal whose distribution is restricted to the South-west of Western Australia. It inhabits coastal and near coastal Peppermint-Tuart, Jarrah-Marri, Sheoak and eucalypt woodland and mallee woodland (preferably closed-canopy) (DPaW, 2017).

Numerous Peppermint trees occurred within the Survey Area and dreys were found in two locations, with additional dreys found south-west along the coastline. Numerous scats were found below shrubs growing along the top of the embankment on the southern side of the reclaimed land, as well as in other areas of the Survey Area (JBS&G, 2024).

Quenda/Southern Brown Bandicoot (*Isoodon obesulus*)

The Quenda/Southern Brown Bandicoot is a small, ground-dwelling mammal which ranges from New South Wales to Western Australia, predominantly in coastal and near-coastal areas. It inhabits forest, woodland, shrub and heath communities, typically with dense, healthy vegetation in the lower stratum (van Dyck, et al., 2013). Most habitats within the site provide suitable habitat for Quenda.

Most Quenda observations were made in and around thickly-grassed, elevated areas of the Survey Area (JBS&G, 2024).

Forest Red-tailed Black Cockatoo (*Calyptorhychus banksii naso*)

The Forest Red-tailed Black Cockatoo is a large bird endemic to the South-west of Western Australia. It relies upon Marri, Jarrah, Wandoo, Tuart and Karri woodlands and forests, where they feed primarily on Marri and Jarrah (Johnstone & Kirkby, 2011).

EPBC Act referral guidelines for black cockatoos (DAWE, 2022) describe referral triggers including the loss of greater than 1 ha of high-quality foraging habitat or the loss of one or more suitable nesting trees. To qualify

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as high-quality foraging habitat for the Forest Red-tailed Black Cockatoo, a site must contain Jarrah or Marri woodland/forest, be on the edge of Karri forest or contain Wandoo or Blackbutt (DAWE, 2022). None of this habitat was present within the site (JBS&G, 2024).

Fairy Tern

The Fairy Tern is a is a small tern occurring along Australia's south coast. It inhabits coastal waters, bays, inlets, saline or brackish lakes, saltfields, sewage ponds near coast (Pizzey & Knight, 2012). It was not seen inside the site, but was seen foraging in the Princess Royal Harbour. Within the site, saline or brackish lakes may provide habitat for Fairy Terns (JBS&G, 2024).

Migratory Birds

Although numerous birds listed as Migratory under the EPBC Act and/or subject to International Agreements were identified within or adjacent to the site, most of the site does not provide suitable habitat for these species, all of which were observed in the Princess Royal Harbor or immediately adjacent. Within the site, saline or brackish lakes may provide occasional habitat for these species and they may utilise the rocky embankment on the southern shoreline (JBS&G, 2024).

3.8.4 Fauna Habitat

Six fauna habitats were identified within the site. Most of these were highly modified but still retained some value to fauna as evidenced by fauna observed during the survey. Approximately 48.65% of the Survey Area was occupied by tracks, hardstand or concrete and provided little to no value for fauna (JBS&G, 2024).

Table 3-10: Fauna habitats in the Survey Area (JBS&G 2024)

Habitat type	Area (ha)	Proportion of Survey Area
Damplands 1	0.62	3.68%
Damplands 2	4.62	27.55%
Disturbed	2.22	13.27%
Drainage Line	0.78	4.67%
Freshwater and Brackish Wetlands	0.36	2.13%
Mudflats and Shoreline	0.01	0.05%
Unvegetated	8.16	48.65%
Total	**16.77**	

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Legend
- Project area
- Cadastre (LGATE-002)

Pre-European Vegetation (DPIRD-006)
- Albany 3
- Major road
- Minor road
- Track

Scale: 1:7,500 at A4 (0 50 100 metres)

Coord. Sys. GDA2020 MGA Zone 50

Job Number: 62317

Client: Rowe Group

Version: A | Date: 01-Sep-2022

Drawn By: cthatcher | Checked By: NM

MAPPED PRE-EUROPEAN VEGETATION

FIGURE 3.9

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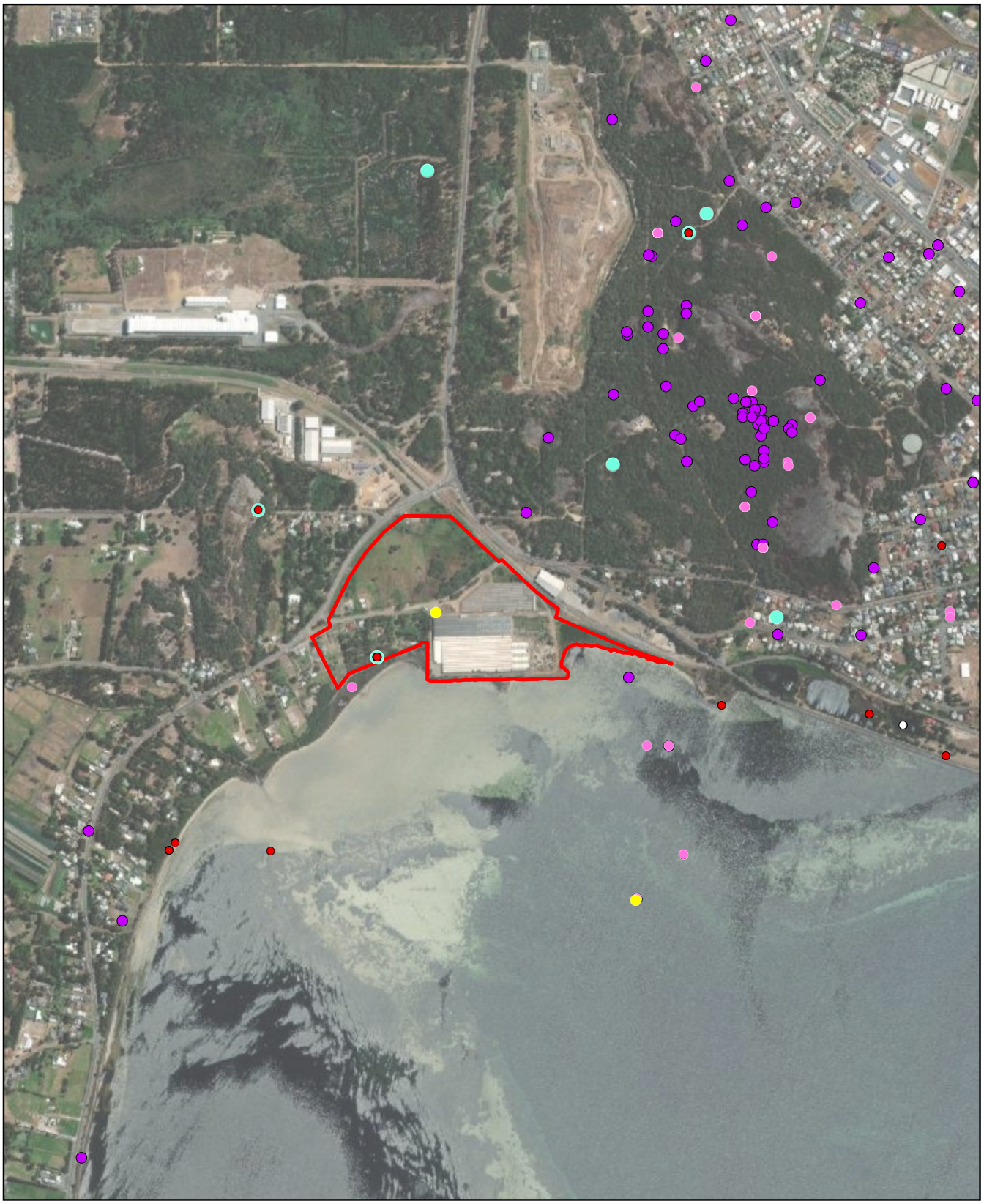

Legend
- Project area
- Cadastre (LGATE-002)

Conservation significant fauna (DBCA)
- Critically endangered
- Endangered
- Migratory
- Other specially protected
- Priority 4
- Vulnerable

Scale: 1:15,000 at A4 (0 100 200 metres)

Coord. Sys. GDA2020 MGA Zone 50

Job Number: 62317

Client: Rowe Group

Version: A | Date: 01-Sep-2022

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CONSERVATION SIGNIFICANT FAUNA

FIGURE 3.10

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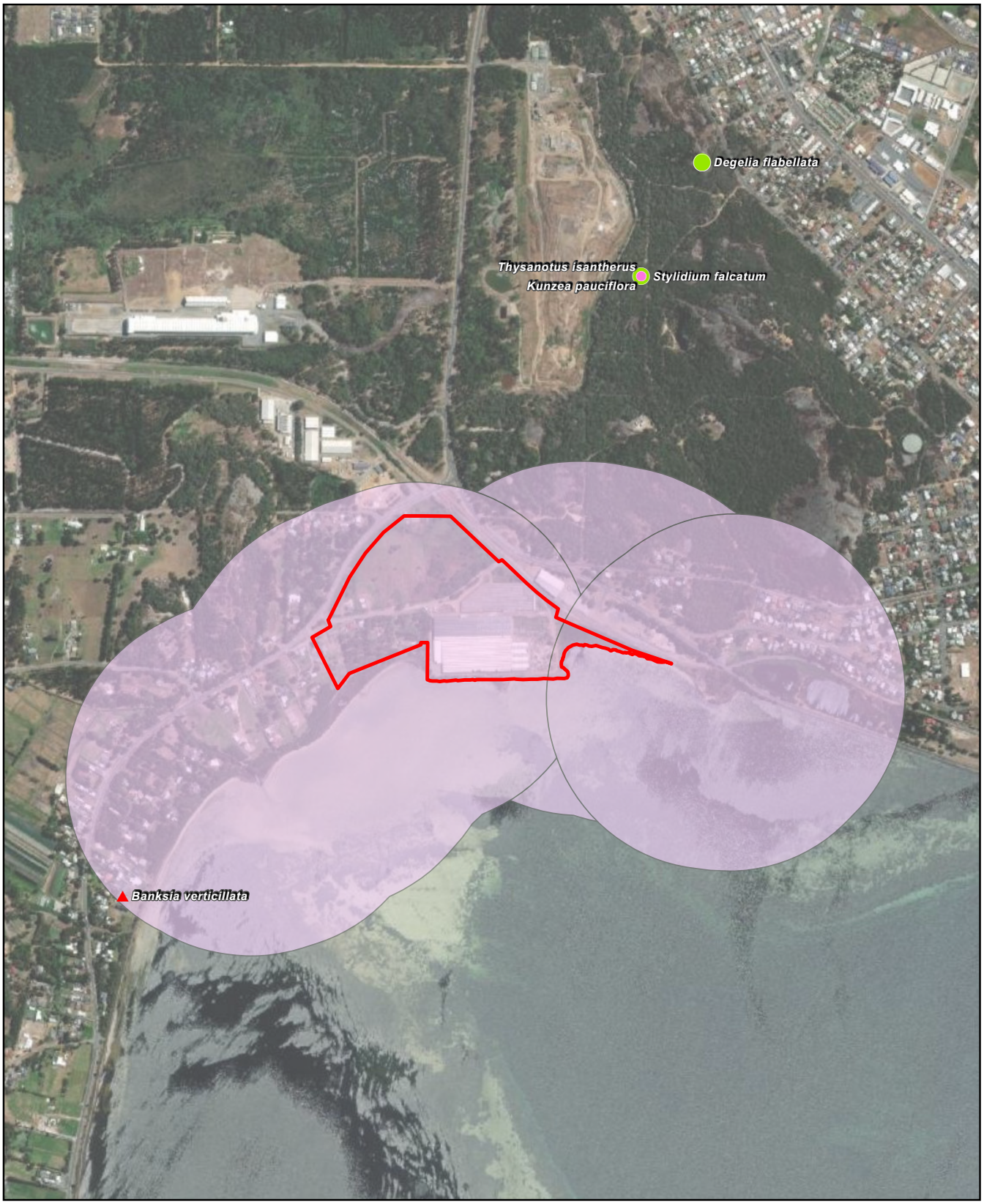

Legend

Project area

Threatened and priority ecological communities (DBCA)

Priority 3

Subtropical and Temperate Coastal Saltmarsh

Conservation significant flora (DBCA)

T

P2

Priority 4

Scale: 1:15,000 at A4

0 100 200 metres

Coord. Sys. GDA2020 MGA Zone 50

Job Number: 62317

Client: Rowe Group

Version: A | Date: 01-Sep-2022

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CONSERVATION SIGNIFICANT FLORA ECOLOGICAL COMMUNITIES

FIGURE 3.11

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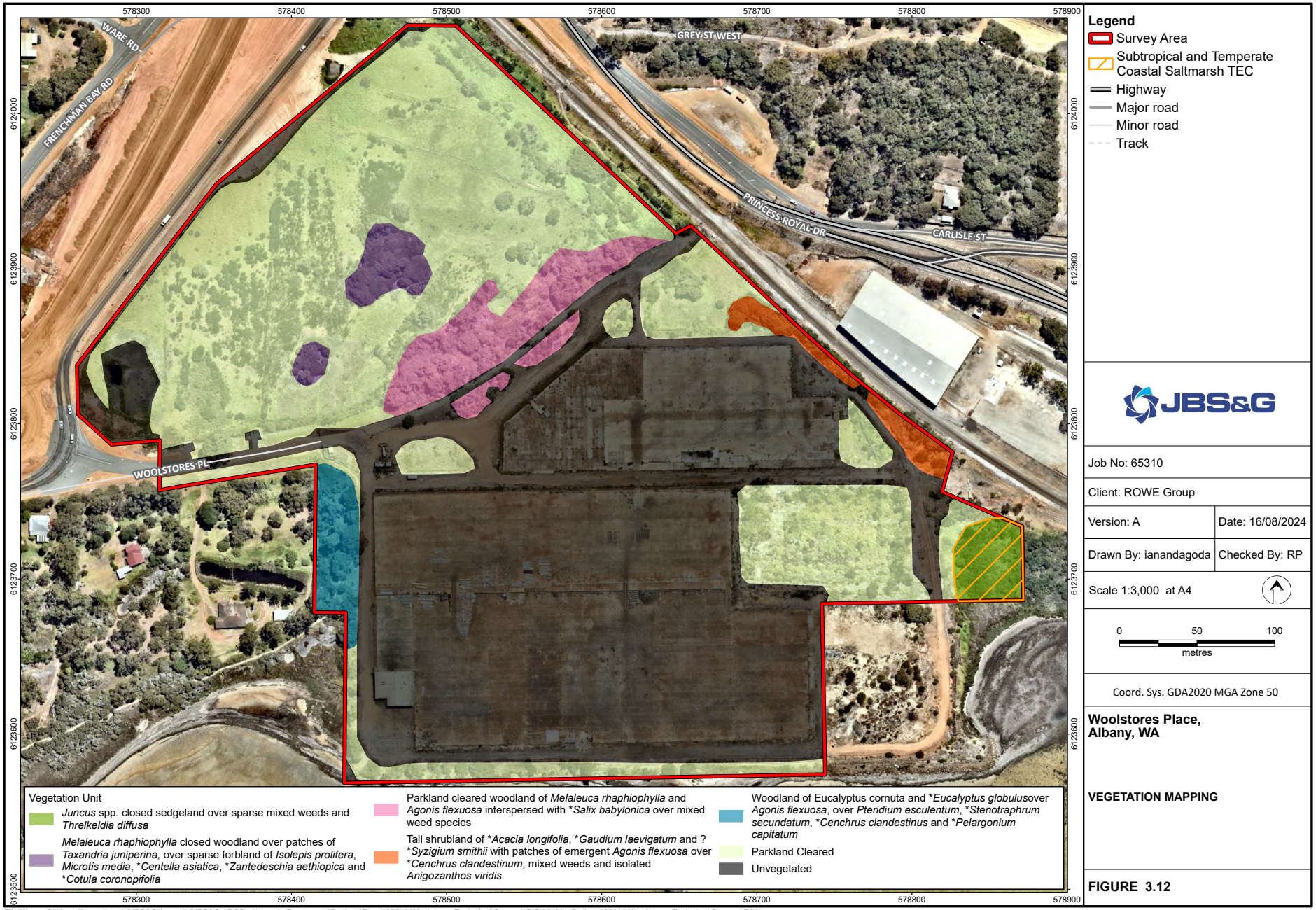

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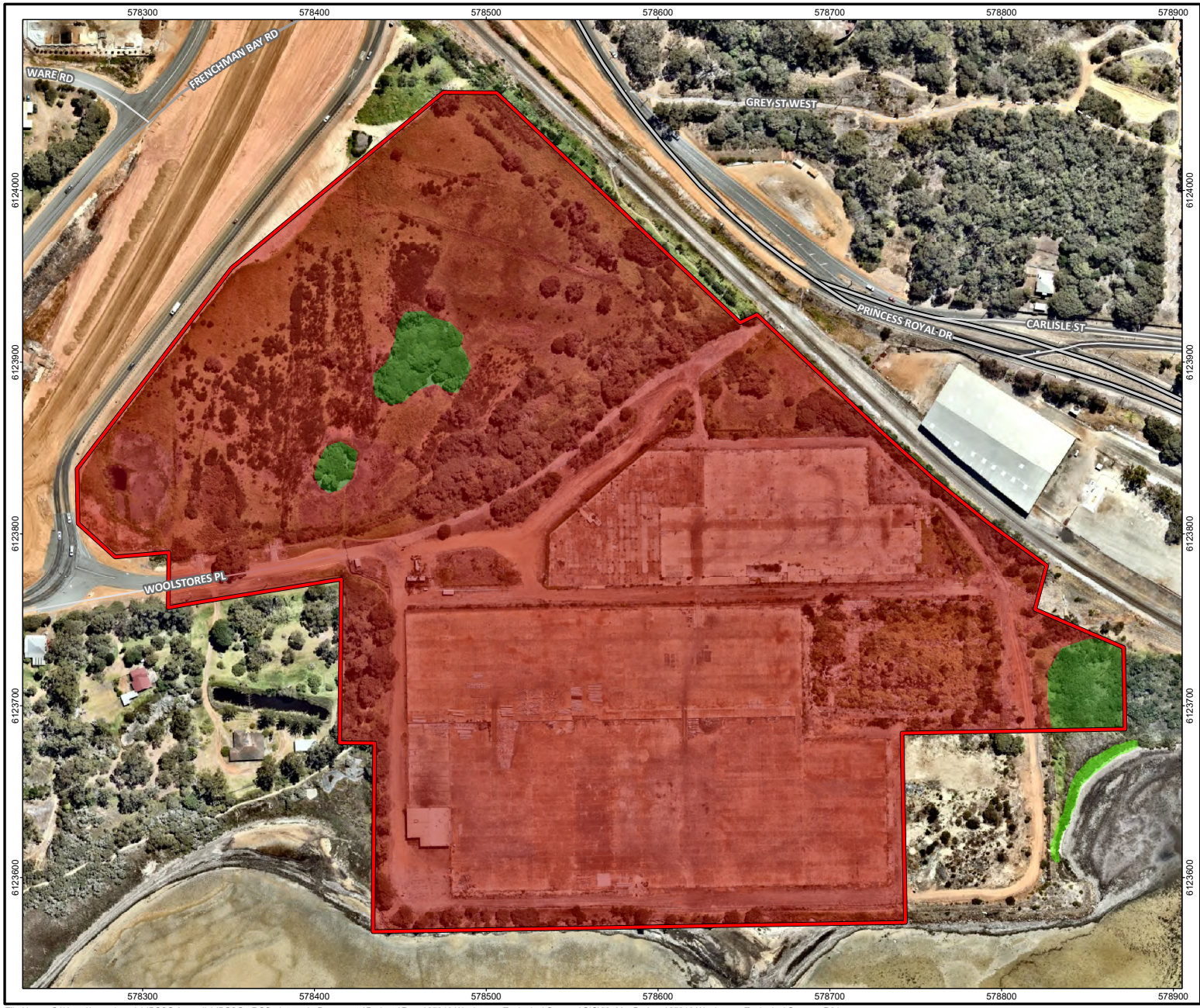

Legend

- Survey Area
- Vegetation condition
  - Very Good
  - Good
  - Completely Degraded
- Highway
- Major road
- Minor road
- Track

JBS&G

Job No: 65310

Client: ROWE Group

Version: A | Date: 16/08/2024

Drawn By: ianandagoda | Checked By: RP

Scale 1:3,000 at A4

0 50 100
metres

Coord. Sys. GDA2020 MGA Zone 50

Woolstores Place, Albany, WA

VEGETATION CONDITION

FIGURE 3.13

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Legend

- Survey Area
- Significant fauna
  - T
  - P4
- Highway
- Major road
- Minor road
- Track

JBS&G

Job No: 65310	
Client: ROWE Group	
Version: A	Date: 16/08/2024
Drawn By: ianandagoda	Checked By: RP
Scale 1:3,000 at A4	

0 50 100
metres

Coord. Sys. GDA2020 MGA Zone 50

Woolstores Place, Albany, WA

SIGNIFICANT FAUNA

FIGURE 3.14

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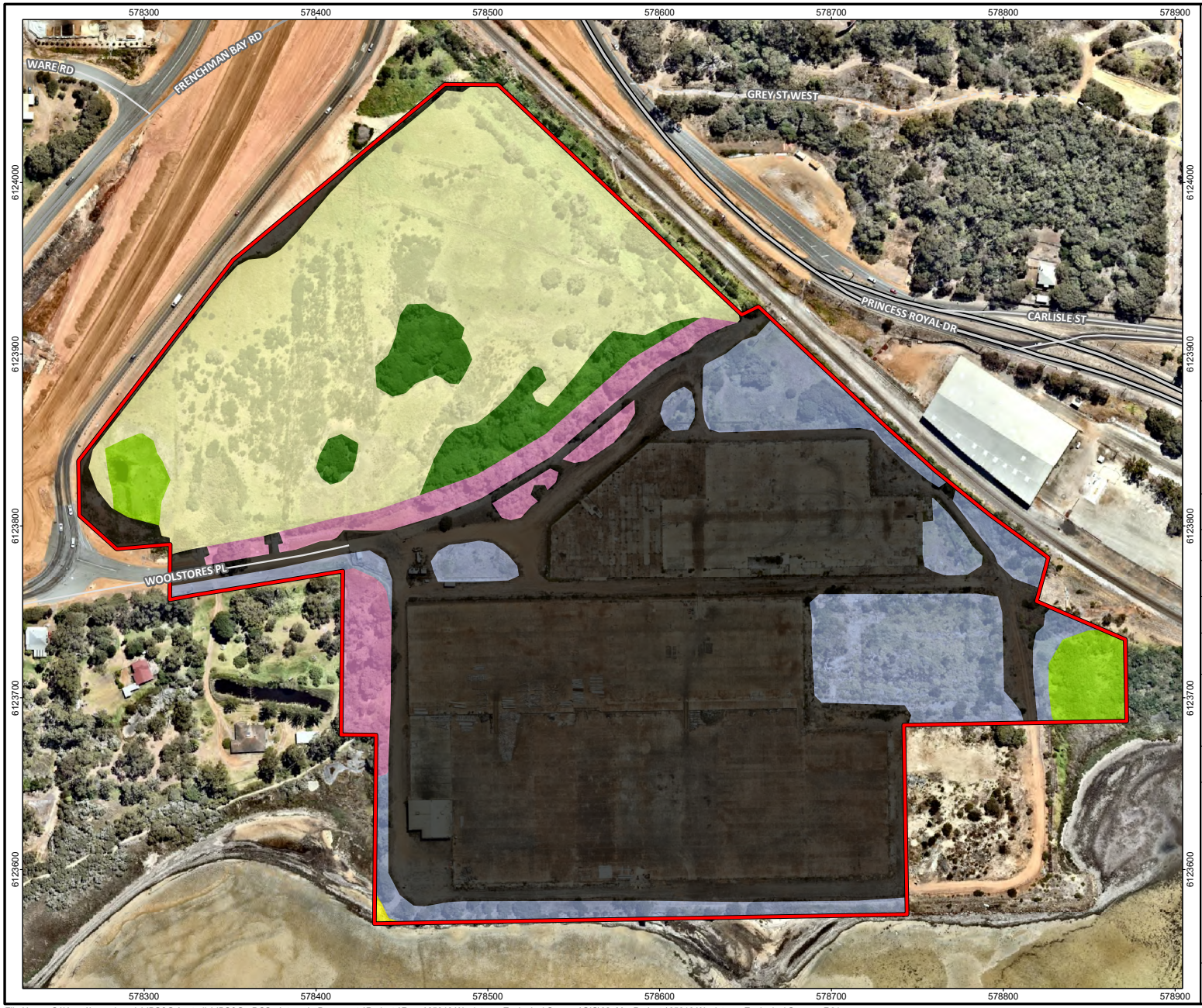

Legend

- Survey Area

Fauna habitat

- Damplands 1
- Damplands 2
- Disturbed
- Drainage Line
- Freshwater and Brackish Wetlands
- Mudflats and Shoreline
- Unvegetated

- Highway
- Major road
- Minor road
- Track

JBS&G

Job No: 65310

Client: ROWE Group

Version: A	Date: 16/08/2024
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Scale 1:3,000 at A4

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metres

Coord. Sys. GDA2020 MGA Zone 50

Woolstores Place, Albany, WA

FAUNA HABITAT

FIGURE 3.15

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3.9 Bushfire Risk & Management

A Bushfire Management Plan (BMP) has been prepared to accompany the proposed rezoning and Structure Plan applications in response to the bushfire prone designation of the site. The BMP addresses Policy Measure 6.3 of State Planning Policy 3.7 Planning in Bushfire Prone Areas in accordance with requirements of Guidelines for Planning in Bushfire Prone Areas. Pre-development bushfire hazard level assessment indicates that the site contains, and is bound by, a combination of moderate and extreme bushfire hazard level vegetation due to the extent of forest, scrub and grassland vegetation retained throughout the locality.

Proposed development of the site will reduce on-site bushfire hazard levels to a moderate hazard level or lower, such that the primary bushfire management response will be targeted at the external site interfaces with the surrounding vegetation extent. Compliance with acceptable solutions of the Guideline Bushfire Protection Criteria will be achieved for the following elements:

- Element 1 Location (i.e., ability for proposed habitable development to deliver a rating of BAL-29 or lower)
- Element 2 Siting and Design of Development (i.e., delivery of BAL-29 or lower through the provision of compliant Asset Protection Zones where required)
- Element 3 Vehicular Access (i.e., provision of two different access routes to two different suitable destinations, as well as a compliant, internal public and private access network)
- Element 4 Water (i.e., provision of a compliant firefighting water supply system).

The BMP demonstrates that compliance with relevant acceptable solutions under the above elements can be achieved at future planning stages, as per policy and guideline provisions.

3.10 Heritage

3.10.1 Aboriginal Heritage

The AH Act aims to protect Aboriginal heritage by registering sites (places and/or objects) that are of cultural importance to Aboriginal people. Any proposal to use or alter an area of land, for purposes such as research or development, must first determine if Aboriginal sites occur within the proposed area. If an Aboriginal site is found to occur, permission must be sought from the Minister for Aboriginal Affairs before that land can be used or altered in any way.

A search of the DPLH Aboriginal Heritage Enquiry System identified that there are no Registered, Lodged and/or Other Aboriginal heritage sites are located within the Site. Despite this, two heritage places Point Melville Campsite and the Frenchman Bay Road Camp occur in proximity to the Site. Information on these sites is provided in Table 3-11 and shown in Figure 3-12.

Table 3-11: Aboriginal Heritage Sites

Site Name	Reference	Site Type	Status
Point Melville Campsite	30637	Historical, Mythological, Camp, Natural Feature, Water Source	Lodged
Frenchman Bay Road Camp	23288	Mythological, Camp, Natural Feature	Other

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3.10.2 State (WA) Heritage

State heritage places are recorded in a variety of different heritage listings. Some of these listings give statutory protection to heritage places, through requirements for heritage-related approvals or referrals. The heritage listing types, custodians and applicable legislation are listed in Table 3-12.

Table 3-12: Heritage Listing Breakdown

Heritage Listing Type	Custodian	Legislation	What is listed?
State Register	Heritage Council (assisted by the Department of Planning, Lands and Heritage [DPLH])	*Heritage Act 2018* and *Heritage Regulations 2019*	Places of State significance included in the State Register of Heritage Places
Conservation Order	Heritage Council (assisted by DPLH)	*Heritage Act 2018* and *Heritage Regulations 2019*	Places of State significance or potential State significance (special cases)
Heritage Agreement	Heritage Council (assisted by DPLH)	*Heritage Act 2018* and *Heritage Regulations 2019*	Places protected by long-term agreement between the parties
Heritage List	Local Governments	*Planning and Development Act 2005*	Places of local heritage significance
National Heritage List	Australian Heritage Council	*Environment Protection and Biodiversity Conservation Act 1999*	Places of national significance

A search of the DPLH Heritage Council State Register identified that there are no Places of State significance and/or State Heritage Places located within the site; however, one State Register Place, Albany Seaboard Bulk Fuel Depot (Place No. 26441) occur in proximity to the site (Figure 3-12).

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Legend
- Project area

Aboriginal heritage places (DPLH-001)
- Other heritage place

Scale: 1:7,000 at A4

0 50 100
metres

Coord. Sys. GDA2020 MGA Zone 50

Job Number: 62317

Client: Rowe Group

Version: A | Date: 01-Sep-2022

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HERITAGE SITES

FIGURE 3.16

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3.11 Coastal Hazard

Within Western Australia, State Planning Policy 2.6: State Coastal Planning Policy (SPP2.6; WAPC 2013) provides guidance on the assessment of coastal hazard risks for assets or infrastructure located near to the coast. The objectives of SPP2.6 are wide ranging, however a key component of SPP2.6 is the identification of appropriate areas for sustainable use of the coast. This includes use for commercial and tourism purposes, which is relevant to the preparation of a structure plan for the Wool Stores site. Assessment of potential coastal hazard risks and adaptation strategies is a requirement to support the preparation of a structure plan.

A localised CHRMAP was undertaken by M P Rogers & Associates Pty Ltd (MRA). The first two stages of a CHRMAP were previously completed by Cardno, for the City of Albany, which includes the site. MRA utilised the findings of this initial CHRMAP risk assessment while conducting the assessment of the site.

The outcomes of the preliminary assessment along with their impacts and management measures are discussed in Section 4.6.

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4. Potential Impacts & Proposed Management Measures

4.1 Flora & Vegetation

The site is mainly comprised of cleared (or 'parkland cleared') paddocks, access roads, fences, and other man-made structures including residential houses and large industrial buildings. As such, the majority of vegetation present is anticipated to be 'Completely Degraded'.

Six vegetation units were identified across the site. The majority of these were dominated by weed taxa and poorly defined.

Saltmarsh vegetation aligning with key criteria of the Subtropical and Temperate Coastal Saltmarsh TEC was observed adjacent to and also within the site with 0.48 ha of intact native vegetation on the eastern end of the site. This TEC is at risk from anthropogenic changes in sea level, with steep embankments preventing saltmarsh from retreating landward as sea levels rise. Other risks to the patch include weed invasion, ASS, stormwater drainage, reinforcement of embankments for development and pedestrian traffic.

4.1.1 Potential Impacts

Potential impacts to Flora & Vegetation resulting from the development of the site are likely to be limited in nature due to the degraded condition of the vegetation, and the existing infrastructure that currently exists on the site.

The seawall proposed as part of the CHRMAP work being undertaken may have potential impacts on flora and vegetation.

4.1.2 Proposed Management

Potential impacts to the TEC resulting from seawall upgrades and drainage will require management. An appropriate tree retention strategy and management plan will need to be determined and approved by the City of Albany.

4.2 Fauna & Habitat

A total of 73 fauna taxa were recorded during the survey including 66 fwithin the Survey Area and additional bird sightings adjacent. Of these, two fauna taxa listed at a State or Commonwealth level were identified within the Survey Area, Western Ringtail Possum and Quenda. One additional listed taxon, the Forest Red-tailed Black Cockatoo was heard outside the Survey Area and ten bird species listed as Migratory and/or under an International Agreement were recorded in or adjacent to the Survey Area. One of these, the Fairy Tern is also listed as Vulnerable under the EPBC Act.

Six fauna habitats were identified within the site. Most of these were highly modified but still retained some value to fauna as evidenced by fauna observed during the field survey. The most significant fauna habitat identified within the site was Western Ringtail Possum habitat (Drainage Line and Damplands 1). This occupied 8.35 % (1.4 ha) of the site. Western Ringtail Possums are listed as Vulnerable under the EPBC Act. Twelve dreys were present in the site and numerous scat, suggesting that the site is well used.

The mudflats adjacent to the site appear important for waders with close to 100 Red-necked Stints, a migratory species subject to International Agreements (EPBC Act, Bonn, CAMBA, JAMBA, ROKAMBA), recorded adjacent to the site.

4.2.1 Potential Impacts

Potential impacts as a result of the development of the site are likely to be limited in nature due to the degradation of the fauna habitat on the site, and the development that currently exists.

The proposed seawall as part of the CHRMAP work being undertaken may have potential impacts on fauna values. These impacts will need to be assessed and mitigated.

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4.2.2 Proposed Management

Proposed management measures can be determined in consultation with relevant agencies. It is likely a trapping and relocation program may be recommended to mitigate impacts to the Western Ringtail Possum and Quenda.

Taking into consideration the lack of favourable breeding or foraging habitat available within the site for Black Cockatoo species, its unlikely further mitigation measures will be required for these species.

4.2.3 Predicted Outcome

No immediate actions are required, until scheme amendment stage. This will also determine the likely regulatory approval pathway.

4.3 Terrestrial Environmental Quality

The site is located in the Albany-Fraser Orogen Nornalup Complex Range Formation. The geomorphology and soil(s) that the site is comprised of contribute to the narrow, swampy coastal plain that makes up the southern portion of the Albany Sandplain hydrological zone. The soils are described by DPIRD (2019) as being relatively non-saline, pale-deep sands that generally support sedgelands and paperbark thickets.

ASS are naturally occurring, iron sulphide-rich soils, sediments, or organic substrates, formed under inundated/waterlogged conditions. when exposed to oxygen, these sulphides can oxidise and release sulfuric acid and heavy metals. This process can occur due to drainage, dewatering or excavation.

The site is classed as having a 'High Probability of Occurrence' (ASRIS 2013) and/or 'High to Moderate risk' (DWER 2017) of ASS occurring within 3 m of the natural soil surface that could be disturbed by most land development activities. The DWER (2015) guidance states that in areas of 'High to Moderate risk' of ASS occurring, an ASS investigation is required prior to the following ground disturbance events:

- earthworks that will disturb more than 100 m3 of soil; and
- during dewatering or soil draining activity.

4.3.1 Potential Impacts

A list of contaminated sites from a search of the DWER contaminated sites database identified seven registered contaminated sites within a 1 km radius of the site, all listed as "Remediated for Restricted Use". The majority of the contamination issues with these sites related to historical usage of:

- Lead products;
- Fertilisers;
- Acidic groundwater and pollutant transport;
- Increased levels of iron, zinc, and copper in groundwater beyond environmental standards (ANZECC).

A PSI comprising a desktop assessment and field inspection has been undertaken which identified the following potential sources of contamination:

1. Former site structures and stockpiled soils.
2. Illegal dumping/fly tipping activities.
3. Potential uncontrolled fill.
4. Historical land uses of the site.
5. Migration of potentially contaminated groundwater beneath the site from up-gradient properties.

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4.3.2 Proposed Management

As identified above, the potential for ASS to be disturbed will be dependent on how the site will be developed and what ground disturbance activities may be implemented during construction. Where ground disturbance triggers are proposed to be met as part of the subdivision works (as outlined in the DWER [2015] guidance), an ASS investigation should be completed to assess the nature and extent of ASS at the site. Should ASS be identified, and its disturbance unavoidable during site construction/development, an ASS management plan should be prepared and implemented during the site development.

A sampling and analysis quality plan (SAQP) has been prepared to inform a Detailed Site Investigation (DSI) to be undertaken that will inform future subdivision and development phases by investigating the contaminated site issues that have been identified via the PSI. This may include the taking of soil and groundwater samples. The SAQP and PSI prepared suitably inform the scheme amendment phase and commitment to the DSI.

4.3.3 Predicated Outcome

Contamination issues associated with the site are initially heavily associated with asbestos (from the wool stores sheds being removed) and other historical land uses of the site. The DSI will be completed as part of preparing for the subdivision phase to inform how the development concept is realised.

4.4 Inland Waters

Groundwater quality in the broader area is fresh to saline, with approximate total dissolved solid concentrations being between 100 to 100,000 mg/L.

Given the site's proximity to the coast, groundwater levels range from approximately 7.5 mbgl to less than 1 mbgl, with surface expressions of groundwater presenting themselves throughout the southern portion of the site. Groundwater flow direction within the site broadly flows in southward toward the coast. No groundwater licences currently exist within the site.

The Site does not fall within any Groundwater Protection Area or Public Drinking Water Source Areas. The closest protectable groundwater area is approximately 1.5 km to the west of the site.

The Site is situated within the Princess Royal Harbour hydrological catchment and sub-catchment of the Albany Coast Basin. There are no perennial waterways onsite; however, surface expressions of groundwater present themselves on a seasonal basis. No significant, Nationally Important (Directory) and/or Ramsar-listed wetlands are present within the Site. Surface water drainage networks drain through the site (from the North) via a main open channel, and into three catchments.

Three CCWs were identified approximately 1.5 km to the North-west of the site.

4.4.1 Potential Impacts

The three CCWs are located 1.5 km up gradient, to the north of the site, and are not expected to be impacted by site activities due to the direction of waterflows being to the south (surface and groundwater).

The site is not within a mapped 100 Year ARI Floodplain Area; however, given its proximity to the foreshore flat of the Royal Princess Harbour, it is subject to inundation. Early site sampling has indicated that groundwater nutrient levels are elevated for the site, possibly contributed from surrounding and historical land uses, requiring further investigation. This will be encapsulated within the scope of the DSI that is currently under development.

There is limited information and data available regarding the impacts of existing land uses on water quality in the Royal Princess Harbour. The Manager of Public Health and Safety at the City of Albany has however reported that water quality within the harbour is generally of a high standard, with regional DWER undertaking regular environmental sampling. There are no reported significant algal blooms or elevated nutrient levels

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reported for this section of Royal Princess Harbour. The water quality should be further improved by the proposed containment of up to 15mm of infiltration on site, through proposed living stream and stormwater attenuation networks that are to be discussed in further detail in the Local Water Management Strategy (LWMS) that is being prepared. The LWMS will further inform potential impacts on the Royal Princess Harbour water quality, from existing and previous surrounding land uses that drain into it.

A key threat to the foreshore Coastal Saltmarsh TEC is stormwater quality, as well as the adjacent estuary water quality. Accordingly, it is recommended that baseline water quality of the drainage lines intersecting this wetland is undertaken (Section 5).

4.4.2 Proposed Management

Consultation with the hydrology consultant has confirmed that for the site to function effectively, no more than 15 mm of stormwater and runoff should be permitted to infiltrate directly to the site, with the remainder directed to Princess Royal Harbour, via the (3) existing catchment networks.

Coastal Hazard Risk Management Adaption Planning has been undertaken by the City of Albany for the Emu Point to Middleton Beach areas, with a Plan publicly released in December 2019. Consultation with City of Albany Senior Planner in June 2022 concluded that any structure plan that is prepared for the site will need to consider the SCA identified in the draft scheme. It will need to consider 1:100-year rainfall event, current topography and soil knowledge and mapping and account for inundation, erosion, sea level rise within the City's existing and proposed Coastal Hazard Risk Management Adaption Planning work. Work is currently being undertaken on hazard lines outlining 1-, 10- and 100-year scenarios. The next proposed steps for that work included:

a. Identifying and analysing ramifications from each hazard line

b. Vulnerability analysis of existing infrastructure etc

c. Risk assessment – rankings from tolerable to immediate action required.

d. Adaption and management plan.

4.4.3 Predicted Outcome

Proposed stormwater and groundwater management for the site is predicted (by the hydrological consultant) to improve current management and control both quality and quantity of flow into Princess Royal Harbour. This will largely be achieved via retaining a maximum of 15mm of runoff/rainfall onsite and construction of living streams and flow moderating infrastructure within the drainage network. MP Rogers were engaged to undertake CHARs works to support structure plan of project.

4.5 Social Surroundings

The site is surrounded by various land uses including the Great Southern Rail, rail yards and sidings, historical market garden sites and various historical industrial land uses.

A search of the DPLH Aboriginal Heritage Enquiry System identified that there are no Registered, Lodged and/or Other Aboriginal heritage sites are located within the site.

A search of the DPLH Heritage Council State Register identified that there are no Places of State significance and/or State Heritage Places located within the site.

4.5.1 Potential Impacts

The historical market garden sites and the rail, corridor and associated infrastructure is up gradient of the subject site and has the potential to impact soil and groundwater and surface water flows through the site, towards Royal Princess Harbour. This will be addressed in more detail as the DSI and associated sampling and analysis scope, and methodology is developed to support scheme amendment and subdivision.

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4.5.2 Proposed Management

The surrounding land uses (potential for contribution to contamination of soil and groundwater) will be addressed during the scoping and methodology of the DSI is developed (including any potential sampling methodology). The impact of surrounding Aboriginal heritage and heritage sites on the site appears to be low and this matter is being considered further as part of the preparation of the structure plan, in accordance with relevant requirements.

4.5.3 Predicted Outcome

From the desktop review the main surrounding land uses that would significantly impact the subject site proceeding to the next phase would be those associated with historical contamination and understanding any potential groundwater or contaminate pathways more fully. This will be informed by further site investigations and studies (such as the DSI and associated sampling and analysis) as part of the scheme amendment and subdivision phases as well as liaison with regulators and key stakeholders continues.

4.6 Coastal Hazards

The key assets, both proposed and existing, identified for the redevelopment during the preliminary assessment were the development Lots 1, 4 – 10 and adjacent road reserves as well as the Princess Royal Drive, Railway Track and Woolstores Place roundabout.

4.6.1 Potential Impact

The outcomes of the preliminary assessment for coastal erosion were identified as:

- Lot 1 being at a Low risk of coastal erosion impact within the 100-year planning timeframe.
- Lots 4 – 7 being at a Low risk of impact until 2122, where the risk is estimated to be Medium.
- Lots 8 – 10 Likely to being at a Medium risk of impact in at the 25-year planning timeframe, with the risk level increasing beyond up to Extreme in 2122.
- The Railway track being estimated to have a High risk level in 2047 and increasing to Extreme beyond this.
- Princess Royal Drive being at a Medium impact is not expected for Princess Royal Drive until 2122.
- Other existing assets being at a generally Low risk of impact.

As for the preliminary impact assessment for coastal inundation, it was identified that the assets, both proposed and existing, are likely to be at Low risk within the planning timeframe, except for Lot 1 which is expected to be at a Medium risk level in 2122.

4.6.2 Potential Management

The proposed approaches for the redevelopment that are deemed applicable would be to either avoid, retreat, accommodate or protect. If the area is to be developed in stages, the proponent may consider developing Lot 1 first, hence avoiding other areas that have a higher coastal hazard risk. Given the close proximity of Lots 4 – 10 to the coastline, the complete avoidance approach would render the Lots undevelopable, which would not be consistent with the relevant local planning policies. Development could occur in Lot 1 within the short to medium term, with triggers in place for the development to be removed if the coastal hazard risk is realised over time. However, this would only be possible for tourism or commercial developments.

The most common approach to accommodating would be to consider the construction of the infrastructures at levels higher than the predicted inundation level, which was found to be approximately 2.18 mAHD. A potential for certain portions of Lot 1 to be inundated in the 100-year planning timeframe was indicated by the inundation hazard map.

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Adjacent to the Woolstores Precinct and Princess Royal Drive is an existing seawall which runs along the coast. This seawall may be extended in front of the precinct and increased to a suitable height to provide protection to the redevelopment lots (and importantly, the rail corridor and Princess Royal Drive). The seawall could tie in along the road reserve adjacent to Lot 3 which would lead up to the road reserve for Lot 1. Future residential owners of Lots 2 and 3 may consider constructing a seawall tying into this also.

Higher level of coastal hazard risk, during the risk assessment, was found to be associated with the adjacent rail line. The latter is very likely to be protected with the construction of a seawall extended landward of the coastal hazard lines, through Rural's land.

4.6.3 Potential Outcome

It is anticipated that by applying the potential management measures outlined in the CHRMAP report, such as construction of infrastructures at higher levels than the predicted inundation level or construction of a seawall, risk of both coastal erosion and inundation would be appropriately managed.

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5. Conclusions

The environmental assessment has identified a number of environmental factors that will require further investigation as part of the next phase of planning and development of the project which include but are not limited to:

- The potential impacts of tidal influence, sea level rise and inundation, including expressions of groundwater throughout the site. These were noted during the site investigations by the Hydrological Consultant. These potential impacts are detailed in the CHRMP by M P Rogers & Associates.
- The PSI completed at the site has identified the following areas of potential environmental concern:
    - Asbestos contamination associated with the former site structures or illegal dumping/fly tipping activities, with all structures and dumping etc to be removed from site (currently underway).
    - Potential uncontrolled fill associated with the reclaimed land that the Woolstores warehouses are built on.
    - Historical industrial land use of the site.
    - Migration of potentially contaminated groundwater from up-gradient properties.

  An intrusive DSI should be undertaken to support scheme amendment stage to investigate the identified areas of potential environmental concern, to assess the potential risk to current and future site receptors. A SAQP should be prepared prior to the DSI to guide the intrusive assessment work and ensure that the data collected is of adequate quality to enable accurate and reliable assessment of human health and ecological risks. This will be undertaken to inform the scheme amendment request and future subdivision stage.
- Soils at the site are considered to have a 'High to Moderate risk' of ASS occurrence within 3 m of the natural soil surface. Should dewatering/soil draining or soil disturbance of more than 100 m^3 be anticipated during the development of the site (particularly during subdivision), then an ASS investigation should be completed to assess the nature and extent of ASS at the site. Should ASS be identified, and its disturbance unavoidable during site construction/development, an ASS management plan should be prepared and implemented during the site development (subdivision).
- The site contains 0.48 ha of intact native vegetation, with the remaining vegetation units being degraded to the extent that they no longer represent a community of indigenous species native to the area. Instead these areas were parkland cleared, with no more than three native flora taxa present.
- Vegetation at the eastern end of the site was consistent with the TEC *Subtropical and Temperate Coastal Saltmarsh*, listed as Vulnerable under the EPBC Act and Priority 3 by DBCA. Dense cover of Juncus has resulted in low native species richness in the patch, but also low levels of weed invasion.
- Given that stormwater quality is a key threat to the remnant foreshore vegetation forming part of the Subtropical and Temperate Coastal Saltmarsh TEC, and estuarine water quality, baseline water quality monitoring within the drainage lines/creeks within the site is recommended.
- Two fauna taxa listed at a State or Commonwealth level were identified within the site, Western Ringtail Possum and Quenda. One additional listed taxon, the Forest Red-tailed Black Cockatoo was heard outside the site and ten bird species listed as Migratory and/or under an International Agreement were recorded in or adjacent to the site. One of these, the Fairy Tern is also listed as Vulnerable under the EPBC Act.

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- Groundwater and surface flow to the site via three main catchments. Surface water quality was identified by the Hydrology Consultant as being acceptable, however early sampling of the shallow groundwater on site indicated elevated levels of nutrient. The preferred approach is to aim for storing up to 15 mm of rainfall/runoff on site, with the residual discharging into Princess Royal Harbour (via an appropriately upgraded integrated drainage network).

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6. Limitations

This report has been prepared for use by the client who has commissioned the works in accordance with the project brief only, and has been based in part on information obtained from the client and other parties.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

JBS&G accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced without prior approval by the client, or amended in any way without prior approval by JBS&G, and should not be relied upon by other parties, who should make their own enquires.

Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements.

Limited sampling and laboratory analyses were undertaken as part of the investigations undertaken, as described herein. Ground conditions between sampling locations and media may vary, and this should be considered when extrapolating between sampling points. Chemical analytes are based on the information detailed in the site history. Further chemicals or categories of chemicals may exist at the site, which were not identified in the site history and which may not be expected at the site.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, JBS&G reserves the right to review the report in the context of the additional information.

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Appendix A PMST Results

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Australian Government

Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 04/08/22 12:00:54

Summary

Details

- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat

Acknowledgements

No Image Available

This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2015

Coordinates

Buffer: 20.0Km

No Image Available

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	63
Listed Migratory Species:	63

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	3
Commonwealth Heritage Places:	None
Listed Marine Species:	90
Whales and Other Cetaceans:	14
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	25
Regional Forest Agreements:	None
Invasive Species:	27
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
South-west

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia	Endangered	Community may occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
Calyptorhynchus baudinii Baudin's Cockatoo, Long-billed Black-Cockatoo [769]	Endangered	Breeding known to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo	Endangered	Breeding known to occur

Name	Status	Type of Presence
[59523]		within area
Cereopsis novaehollandiae grisea		
Cape Barren Goose (south-western), Recherche Cape Barren Goose [25978]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus		
Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Dasyornis longirostris		
Western Bristlebird [515]	Endangered	Species or species habitat likely to occur within area
Diomedea antipodensis		
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea dabbenena		
Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora		
Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans		
Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi		
Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area
Falco hypoleucos		
Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area
Halobaena caerulea		
Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica menzbieri		
Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Critically Endangered	Species or species habitat known to occur within area
Macronectes giganteus		
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli		
Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica		
Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Phoebetria fusca		
Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Psophodes nigrogularis nigrogularis		
Western Heath Whipbird [64449]	Endangered	Species or species habitat known to occur within area
Pterodroma mollis		
Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Sternula nereis nereis		
Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Thalassarche carteri		
Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta		
Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area
Fish		
Nannatherina balstoni		
Balston's Pygmy Perch [66698]	Vulnerable	Species or species habitat likely to occur within area
Insects		
Trioza barrettae		
Banksia brownii plant louse [87805]	Endangered	Species or species habitat known to occur within area
Mammals		
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus		
Fin Whale [37]	Vulnerable	Species or species habitat may occur within area
Dasyurus geoffroii		
Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Breeding known to occur within area
Neophoca cinerea		
Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat likely to occur within area
Parantechinus apicalis		
Dibbler [313]	Endangered	Species or species habitat known to occur within area
Pseudocheirus occidentalis		
Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat known to occur within area
Other		
Westralunio carteri		
Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat likely to occur within area
Plants		

Name	Status	Type of Presence
Banksia brownii		
Brown's Banksia, Feather-leaved Banksia [8277]	Endangered	Species or species habitat known to occur within area
Banksia goodii		
Good's Banksia [16727]	Vulnerable	Species or species habitat known to occur within area
Banksia verticillata		
Granite Banksia, Albany Banksia, River Banksia [8333]	Vulnerable	Species or species habitat likely to occur within area
Caladenia granitora		
[65292]	Endangered	Species or species habitat may occur within area
Caladenia harringtoniae		
Harrington's Spider-orchid, Pink Spider-orchid [56786]	Vulnerable	Species or species habitat known to occur within area
Calectasia cyanea		
Blue Tinsel Lily [7669]	Critically Endangered	Species or species habitat known to occur within area
Chordifex abortivus		
Manypeaks Rush [64868]	Endangered	Species or species habitat known to occur within area
Conostylis misera		
Grass Conostylis [21320]	Endangered	Species or species habitat likely to occur within area
Diuris drummondii		
Tall Donkey Orchid [4365]	Vulnerable	Species or species habitat known to occur within area
Drakaea micrantha		
Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat known to occur within area
Isopogon uncinatus		
Albany Cone Bush, Hook-leaf Isopogon [20871]	Endangered	Species or species habitat known to occur within area
Kennedia glabrata		
Northcliffe Kennedia [16452]	Vulnerable	Species or species habitat likely to occur within area
Microtis globula		
South-Coast Mignonette Orchid [6780]	Vulnerable	Species or species habitat likely to occur within area
Sphenotoma drummondii		
Mountain Paper-heath [21160]	Endangered	Species or species habitat may occur within area
Verticordia fimbrilepis subsp. australis		
Southern Shy Featherflower [24630]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Sharks		

Name	Status	Type of Presence
Carcharias taurus (west coast population)		
Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Breeding known to occur within area
Ardenna grisea		
Sooty Shearwater [82651]		Species or species habitat may occur within area
Diomedea antipodensis		
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea dabbenena		
Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora		
Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans		
Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi		
Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area
Hydroprogne caspia		
Caspian Tern [808]		Breeding known to occur within area
Macronectes giganteus		
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli		
Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Onychoprion anaethetus		
Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur within area
Phoebetria fusca		
Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche carteri		
Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Thalassarche cauta		
Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area
Migratory Marine Species		
Balaena glacialis australis		
Southern Right Whale [75529]	Endangered*	Breeding known to occur within area
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Species or species habitat may occur within area
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus		
Fin Whale [37]	Vulnerable	Species or species habitat may occur within area
Caperea marginata		
Pygmy Right Whale [39]		Species or species habitat may occur within area
Carcharhinus longimanus		
Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Lagenorhynchus obscurus		
Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus		
Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi		
Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat known to occur within area
Manta birostris		
Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray		Species or species habitat known to occur

Name	Threatened	Type of Presence
[84995]		within area
Megaptera novaeangliae		
Humpback Whale [38]		Species or species habitat known to occur within area
Orcinus orca		
Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres		
Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba		
Sanderling [875]		Roosting known to occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis		
Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris		
Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius bicinctus		
Double-banded Plover [895]		Roosting known to occur within area
Charadrius mongolus		
Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Gallinago megala		
Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura		
Pin-tailed Snipe [841]		Roosting likely to occur within area
Limosa lapponica		
Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa		
Black-tailed Godwit [845]		Roosting known to occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur

Name	Threatened	Type of Presence
		within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Thalasseus bergii Greater Crested Tern [83000]		Breeding known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -
Defence - ALBANY TRAINING DEPOT
Defence - ALBANY TRAINING DEPOT ; AIRTC ALBANY

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area

Name	Threatened	Type of Presence
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Cereopsis novaehollandiae grisea Cape Barren Goose (south-western), Recherche Cape Barren Goose [25978]	Vulnerable	Species or species habitat known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area
Eudyptula minor Little Penguin [1085]		Breeding known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area

Name	Threatened	Type of Presence
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area
Larus novaehollandiae Silver Gull [810]		Breeding known to occur within area
Larus pacificus Pacific Gull [811]		Breeding known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Pelagodroma marina White-faced Storm-Petrel [1016]		Breeding known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area

Name	Threatened	Type of Presence
Pterodroma macroptera		
Great-winged Petrel [1035]		Breeding known to occur within area
Pterodroma mollis		
Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Puffinus assimilis		
Little Shearwater [59363]		Breeding known to occur within area
Puffinus carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Breeding known to occur within area
Puffinus griseus		
Sooty Shearwater [1024]		Species or species habitat may occur within area
Recurvirostra novaehollandiae		
Red-necked Avocet [871]		Roosting known to occur within area
Sterna anaethetus		
Bridled Tern [814]		Foraging, feeding or related behaviour likely to occur within area
Sterna bergii		
Crested Tern [816]		Breeding known to occur within area
Sterna caspia		
Caspian Tern [59467]		Breeding known to occur within area
Thalassarche carteri		
Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta		
Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area
Thinornis rubricollis		
Hooded Plover [59510]		Species or species habitat known to occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis		
Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus		
Terek Sandpiper [59300]		Roosting known to occur within area
Fish		
Acentronura australe		
Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
Campichthys galei		
Gale's Pipefish [66191]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Leptoichthys fistularius Brushtail Pipefish [66248]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Vanacampus poecilolaemus		
Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri		
Long-nosed Fur-seal, New Zealand Fur-seal [20]		Breeding known to occur within area
Neophoca cinerea		
Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata		
Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Species or species habitat may occur within area
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus		
Fin Whale [37]	Vulnerable	Species or species habitat may occur within area
Caperea marginata		
Pygmy Right Whale [39]		Species or species habitat may occur within area
Delphinus delphis		
Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Breeding known to occur within area
Grampus griseus		
Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus		
Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae		
Humpback Whale [38]		Species or species habitat known to occur within area
Orcinus orca		
Killer Whale, Orca [46]		Species or species

Name	Status	Type of Presence
		habitat may occur within area
Tursiops aduncus		
Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str.		
Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Bakers Junction	WA
Bon Accord Road	WA
Down Road	WA
Eclipse Island	WA
Gledhow	WA
Green Island	WA
Gull Rock	WA
Lake Powell	WA
Marbelup	WA
Michaelmas Island	WA
Mill Brook	WA
Mistaken Island	WA
Mount Mason	WA
Phillips Brook	WA
Seal Island (WA32199)	WA
Shelter Island	WA
Torndirrup	WA
Unnamed WA23088	WA
Unnamed WA23923	WA
Unnamed WA30791	WA
Unnamed WA32478	WA
Unnamed WA33308	WA
Unnamed WA44685	WA
Voyagers Park	WA
West Mount Mason	WA

Invasive Species	[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Anas platyrhynchos		
Mallard, Northern Mallard [974]		Species or species habitat likely to occur within area
Columba livia		
Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Streptopelia senegalensis		
Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus declinatus Bridal Veil, Bridal Veil Creeper, Pale Berry Asparagus Fern, Asparagus Fern, South African Creeper [66908]		Species or species habitat likely to occur within area
Asparagus scandens Asparagus Fern, Climbing Asparagus Fern [23255]		Species or species habitat likely to occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red		Species or species habitat likely to occur

Name	Status	Type of Presence
Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Oyster Harbour	WA

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-35.02542 117.86006

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix B Flora Likelihood of occurrence assessment

Taxon	Conservation Status		Description	PMST Distribution	Likelihood of occurrence
	BC Act	EPBC Act			
Acacia ataxiphylla subsp. *ataxiphylla*	P3		Prostrate, sprawling shrub, 0.15-0.5 m high, to 1 m wide. Fl. yellow, Nov to Dec or Jan. Gravelly clay loam, white/grey sand. Flats, roadsides.		Habitat present and records within the vicinity in the 1930's
Acacia prismifolia	EX		Shrub, 0.15-0.5 m high. Rocky slopes.		No habitat present, classified extinct.
Adenanthos x cunninghamii	P4		Erect open shrub, 1-3 m high. Fl. red/pink-red, Mar or Sep to Oct. Grey sand. Coastal dunes & sandplains.		Habitat present and records within the vicinity < 3.75km
Agrostocrinum scabrum subsp. *littorale*	P2		Rhizomatous, perennial, herb, to 0.15 m high. Fl. blue, Oct to Nov. Shallow granite loams. Coastal slopes.		Habitat present and records within the vicinity < 3.75km
Amanita drummondii	P3		"Fungi. Solitary to gregarious in leaf litter in association with Agonis flexuosa, A. theiformis, Allocasuarina fraseriana, Corymbia calophylla, Eucalyptus marginata, E. patens, E.staeri, Jacksonia furcellata, Kunzea glabrescens, Melaleuca sp., Podocarpus drouynianus, Taxandria parviceps"		No records within the vicinity (< 7.5km)
Amanita preissii	P3		"Fungi. Solitary to gregarious in sandy soil and lateritic gravel, in native vegetation; nearby plants include Allocasuarina fraseriana, Acacia pulchella, Corymbia calophylla, Callitris sp., Eucalyptus gomphocephala, E. marginata, Macrozamia fraseri and Pinus pinaster"		Habitat present but no records within the vicinity (< 7.5km)
Andersonia auriculata	P3		Erect or spreading shrub, 0.1-0.3(-0.5) m high. Fl. white & blue, Apr to Oct. Grey or peaty sand, often		Habitat present and records within the vicinity < 3.75km

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Taxon	Conservation Status		Description	PMST Distribution	Likelihood of occurrence
	BC Act	EPBC Act			
			over laterite. Swampy areas, granite outcrops.		
Andersonia setifolia	P3		Decumbent to erect, cushion-forming shrub, 0.05-0.15 m high. Fl. red/white, Jun to Oct. Sandy & gravelly soils. Hillslopes & breakaways.		Habitat is present, but there are no records within the vicinity.
Andersonia sp. Jamesii (J. Liddelow 84)	P4		No Information		No records within the vicinity (<7.5km)
Asplenium decurrens	P4		Rhizomatous, clusters, erect fern. 0.08 - 0.6 m high. Sheltered coastal scrub on granite.		Habitat is present, but there are no records within the vicinity.
Austrostipa mundula	P3		Perennial, tufted. 0.20– 0.60 m high, Fl. Brown, Sept- Nov. Sand over limestone on moderate slope.		No habitat present.
Banksia brownii	CR	EN	Bushy, non-lignotuberous shrub or tree (small), 1-6 m high. Fl. cream & brown/orange-red, Mar to Jul. Sand over laterite, gravel, loam over granite. In gullies.	Species or species habitat known to occur within area	Habitat present and records within the vicinity < 7.5km
Banksia goodii	VU	VU	Lignotuberous, prostrate shrub, ca 0.2 m high. Fl. orange-brown-red, May or Nov. White or grey sand over laterite.	Species or species habitat known to occur within area	Habitat present but no records within the vicinity (< 7.5km)
Banksia seneciifolia	P4		Columnar,non-lignotuberous shrub, 0.6-1 m high. Fl. cream-yellow-brown, Jun or Aug. Sandy loam, sand. Rocky hillsopes.		Habitat present but no records within the vicinity (< 7.5km)
Banksia serra	P4		Erect, slender, non-lignotuberous shrub, 1-4(-7) m high. Fl. yellow/cream-green, Jul to Sep. Gravel, sand, or clay loam over laterite. Hillslopes.		Habitat present but no records within the vicinity (< 7.5km)
Banksia verticillata	CR	VU	Non-lignotuberous shrub or tree (rarely), 1.3-6 m high. Fl. yellow-orange, Jan to Apr. Sandy loam. On or beside granite outcrops.	Species or species habitat likely	Habitat present and records within the vicinity < 3.75km

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Taxon	Conservation Status		Description	PMST Distribution	Likelihood of occurrence
	BC Act	EPBC Act			
				to occur within area	
Boronia crassipes	P3		Erect, spindly shrub, 0.5-2 m high. Fl. red-pink, Aug to Sep. Sand, peaty sand. Winter-wet swamps, creeklines.		Habitat present and records within the vicinity < 3.75km
Bossiaea sp. Mt Frankland (L. Graham 2174)	P2		Shrub, 1 -2m high, Fl. Yellow and purplish brown, Oct- Nov. Granite outcrop, sandy loam.		Habitat present and records within the vicinity < 3.75km
Caladenia evanescens	P1		Tuberous, perennial, herb, 0.15-0.2 m high. Fl. green-cream-yellow, Nov. Sand. Consolidated sand dunes.		Habitat present and records within the vicinity < 3.75km
Caladenia granitora	EN	EN	Tuberous, perennial, herb, 0.2-0.35 m high. Fl. cream & white & red, Oct to Nov. Shallow soil crevices on granite. Coastal areas	Species or species habitat may occur within area	Habitat present but no records within the vicinity (< 7.5km)
Caladenia harringtoniae	VU	VU	Tuberous, perennial, herb, 0.2-0.4 m high. Fl. pink, Oct to Nov. Sandy loam. Winter-wet flats, margins of lakes, creeklines, granite outcrops.	Species or species habitat known to occur within area	Habitat present and records within the vicinity < 3.75km
Calandrinia sp. Torndirrup (S.D. Hopper et al. SDH 8712)	P2		Prostrate, annual, succulent. Fl. Pink, white, green, Nov. Grey sand and peat.		Habitat not present
Calectasia cyanea	CR	CR	Rhizomatous, clump forming, woody perennial, herb, 0.1-0.6 m high, to 0.3 m wide. Fl. blue/purple, Jun to Oct. White, grey or yellow sand, gravel.	Species or species habitat known to occur within area	Habitat present and records within the vicinity < 3.75km
Caustis sp. Boyanup (G.S. McCutcheon 1706)	P3		Rhizomatous, clumped perennial, grass-like or herb (sedge), 0.7-1 m high. White or grey sand.		Habitat present but no records within the vicinity (< 7.5km)
Chordifex abortivus	VU	EN	Rhizomatous, erect perennial, herb, to 0.5 m high. Fl. brown, Sep to Oct. Sand. Low rises & undulating areas.	Species or species habitat known to	Habitat present but no records within the vicinity (< 7.5km)

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Taxon	Conservation Status		Description	PMST Distribution	Likelihood of occurrence
	BC Act	EPBC Act			
				occur within area	
Chorizema carinatum	P3		Erect or spreading shrub, 0.1-0.6 m high. Fl. yellow, Oct to Dec. Sand, sandy clay.		Habitat not present and record present from 1882
Conospermum quadripetalum	P2		Diffuse, straggly shrub, 0.3-1 m high. Fl. blue/white, Sep to Nov. Sandy clay, grey sand. Flats behind coastal hills.		Habitat present and records within the vicinity < 7.5km
Conospermum spectabile	P2		Erect, compact shrub, 0.5-0.8 m high. Fl. white & blue, Oct to Nov. Sandy soils.		Habitat present and records within the vicinity < 7.5km
Conostylis misera	VU	EN	Rhizomatous, tufted perennial, grass-like or herb, 0.05-0.18 m high. Fl. yellow, Oct to Nov. White or grey sand, sandy loam. Winter-wet flats.	Species or species habitat likely to occur within area	Habitat present and records within the vicinity < 3.75km
Corybas abditus	P3		Tuberous, perennial, dwarf herb, 0.01-0.02 m high. Fl. red-purple, Oct to Nov. Black peaty soils. Winter-wet swamps.		Habitat not present and no records within the vicinity (< 7.5km)
Corybas limpidus	P4		Tuberous, perennial, dwarf herb, 0.01 m high. Fl. red & green, Aug to Sep. Sand. Coastal dunes.		Habitat present and records within the vicinity < 3.75km
Degelia flabellata	P2		Foliose lichen. Granite outcrops.		Habitat present and records within the vicinity < 3.75km
Diuris drummondii	VU	VU	Tuberous, perennial, herb, 0.5-1.05 m high. Fl. yellow, Nov to Dec or Jan. Low-lying depressions, swamps.		Habitat present but no records within the vicinity (< 7.5km)
Drakaea micrantha	EN	VU	Tuberous, perennial, herb, 0.15-0.3 m high. Fl. red & yellow, Sep to Oct. White-grey sand.	Species or species habitat known to occur within area	Habitat present but no records within the vicinity (< 7.5km)
Drosera fimbriata	P4		Erect tuberous, perennial, herb, 0.05-0.15 m high. Fl. white, Sep to Oct. White sand, granite.		Habitat present and records within the vicinity < 7.5km

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Taxon	Conservation Status		Description	PMST Distribution	Likelihood of occurrence
	BC Act	EPBC Act			
Drosera paleacea	P1		Small perennial herb. Fl. White, Dec. Sandplains, grey, brown sand.		Habitat present and records within the vicinity < 3.75km
Eucalyptus newbeyi	P3		Tree, 5-8 m high, bark smooth. Fl. yellow-green, Sep to Dec or Jan to Feb. Sandy clay, loam. Steep spongolite valley sides & cliffs forming riverbanks.		Habitat not present and no records within the vicinity (<7.5km)
Eucalyptus x missilis	P4		(Mallee), to 3 m high, bark smooth. Fl. yellow/cream-white, Jan to Apr. Sand over limestone or granite. Coastal sites.		Habitat present but no records within the vicinity (< 7.5km)
Gahnia sclerioides	P4		Lax, slender rhizomatous, perennial, grass-like or herb (sedge), 0.3-0.9 m high. Loam, sandy soils. Moist shaded situations.		Habitat present and records within the vicinity < 7.5km
Gonocarpus pusillus	P4		Prostrate annual, herb, 0.05-1.2 m high. Fl. green/yellow-red, Nov to Dec. Grey sandy clay. Winter-wet swamps.		Habitat not present and record present from 1902
Gonocarpus simplex	P4		Tufted perennial, herb, 0.2-0.6 m high. Fl. green/red-brown, Nov to Dec. Peaty sand. Swamps, seasonally inundated areas.		Habitat present but no records within the vicinity (< 7.5km)
Goodenia sp. South Coast (A.R. Annels ARA 1846)	P3		Slender, erect herb, 0.3-0.45 m high. Fl. blue, Nov to Dec. Gravelly loams, sandy clays. Edge granite outcrop, roadside.		Habitat present but no records within the vicinity (< 7.5km)
Gyrostemon thesioides	P2		Straggling, decumbent shrub, to 0.7 m high. Fl. red-orange-yellow/yellow-green, Nov. Sand over limestone. Consolidated coastal dunes.		Habitat not present and record present from 1840-1902
Hakea lasiocarpha	P3		Erect shrub, to 6 m high. Fl. white, May to Jul. Sandy loam soils, organic litter over sand, clay, or gravel. Hill tops, valleys.		Habitat not present
Hydrocotyle serendipita	P2		Prostrate herb, to 20cm. Fl. White, Nov to Dec. Brown sand clay loam to dry grey sand.		Habitat not present

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Taxon	Conservation Status		Description	PMST Distribution	Likelihood of occurrence
	BC Act	EPBC Act			
Isopogon buxifolius var. *buxifolius*	P3		Upright shrub, (0.3-)0.6-1.5 m high. Fl. pink, May or Jul to Oct. Sandy soils, gravelly loam, or clay.		Habitat present and records within the vicinity < 3.75km
Isopogon uncinatus	CR	EN	Tufted spreading or prostrate, non-lignotuberous shrub, 0.05-0.4 m high. Fl. yellow/cream, Oct to Nov. Loam or sand on granite, peaty sand. Swampy depressions, hillslopes.	Species or species habitat known to occur within area	Habitat present and records within the vicinity < 3.75km
Juncus meianthus	P3		Tufted perennial, herb, 0.05-0.2 m high, to 0.4 m wide. Fl. brown, Nov to Dec or Jan. Black sand, sandy clay. Creeks, seepage areas.		Habitat not present and no records within the vicinity (<7.5km)
Kennedia glabrata	V U	VU	Prostrate shrub, 0.05-0.5 m high, to 5 m wide. Fl. red, Aug to Nov. Soil pockets, sandy soils. Granite oucrops.	Species or species habitat likely to occur within area	Habitat present but no records within the vicinity (< 7.5km)
Kunzea pauciflora	P4		Erect, compact shrub, (0.35-)0.5-1.2(-1.5) m high. Fl. pink, Aug to Nov. Gravelly sandy or loamy soils over limestone, sandstone or spongolite. Hillsides, coastal slopes.		Habitat present and records within the vicinity < 3.75km
Lachnagrostis billardierei subsp. *billardierei*	P3		Annual, herb. Fl. purple/green, Dec. Sand over granite. Hilltops.		Habitat not present and no records within the vicinity (<7.5km)
Lasiopetalum sp. Denmark (B.G. Hammersley 2012)	P3		Open low shrub, up to 0.8m high. Fl. Cream to pink, Aug to Oct. yellow to grey sand clay loam		Habitat present but no records within the vicinity (< 7.5km)
Lepidium pseudotasmanicum	P4		Erect annual or biennial, herb, 0.2-0.4(-1) m high. Fl. white-green, Feb or Dec. Loam, sand.		Habitat present and records within the vicinity < 3.75km
Leucopogon alternifolius	P3		Erect or semi-erect, scrambling shrub, 0.1-1(-2) m high. Fl. white/white-pink, Aug to Dec. Grey/white sand. Swampy areas, seasonally wet areas.		Habitat present and records (1902) within the vicinity < 3.75km

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Taxon	Conservation Status		Description	PMST Distribution	Likelihood of occurrence
	BC Act	EPBC Act			
Leucopogon altissimus	P3		Erect shrub to 2 m high. Fl. Creamy -white, Aug to Oct. Grey sand clay loam over granite.		Habitat present but no records within the vicinity (< 7.5km)
Leucopogon bracteolaris	P2		Shrub, 0.25-1 m high. Fl. white, Feb or May or Jul or Oct. Stony sand, gravelly loam.		Habitat present and records within the vicinity < 3.75km
Lysinema lasianthum	P4		Spindly shrub, 0.25-0.7 m high. Fl. white-cream, Jul to Nov. Swamps, seasonally wet areas.		Habitat not present and record present from 1900-1936
Microtis globula	VU	VU	Tuberous, perennial, herb, 0.18-0.35 m high. Fl. yellow-green, Dec or Jan. Peaty soils. Winter-wet swamps.		Habitat not present and no records within the vicinity (<7.5km)
Microtis pulchella	P4		Tuberous, perennial, herb, 0.12-0.25 m high. Fl. white, Nov to Dec or Jan. Peaty sand. Winter-wet swamps.		Habitat present and records within the vicinity < 3.75km
Microtis quadrata	P4		Erect herb with tuber up to 1 m. Fl. Green to creamy white, Oct to Dec. White sand to grey clay.		Habitat present and records within the vicinity < 3.75km
Pleurophascum occidentale	P4		Cryptogam, perennial up to 2.5mm high. White-grey sand-quartz.		Habitat not present
Poa billardierei	P3		Clumped rhizomatous herb up to 1m high. Coastal dune. White sand.		Habitat present and records within the vicinity < 7.5km
Prasophyllum paulinae	P1		Deciduous terrestrial up to 0.4m. Fl. Pale green to purple/red. Oct. Black sand/peat.		Habitat not present
Pterostylis heberlei	P2		Tuberous herb. Fl. Green, Oct. Black sandy clay over granite.		Habitat not present
Schoenus sp. Grassy (E. Gude & J. Harvey 250)	P2		Rhizomatous, perennial, grass-like or herb (sedge), to 0.7 m high. Fl. yellow. Black silt. Swamps.		Habitat present and records within the vicinity < 7.5km
Schoenus sp. Grey Rhizome (K.L. Wilson 2922)	P1		Grass-like or herb (sedge), 0.06-0.08 m high. Sandy clay, sand.		Habitat present and records within the vicinity < 7.5km
Sphenotoma drummondii	EN	EN	Tufted shrub, 0.15-0.5 m high. Fl. white, Sep to Dec. Stony or	Species or species	Habitat present but no records within

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Taxon	Conservation Status		Description	PMST Distribution	Likelihood of occurrence
	BC Act	EPBC Act			
			shallow soils over granite or quartzite. Steep rocky slopes, crevices of rocks.	habitat may occur within area	the vicinity (< 7.5km)
Spyridium spadiceum	P4		Erect slender or weak semi-prostrate shrub, 0.15-3 m high. Fl. white, Aug to Dec or Jan to Feb or Apr. Sand or gravelly loam. Granitic hills.		Habitat present and records within the vicinity < 3.75km
Stenanthemum sublineare	P2		Erect shrub, to 0.1 m high. Fl. green, Oct to Dec. Littered white sand. Coastal plain.		Habitat present but no records within the vicinity (< 7.5km)
Stylidium articulatum	P2		Rosetted perennial, herb, 0.15-0.25 m high, Leaves erect to spreading, oblanceolate, 3-8 cm long, 5-14 mm wide, apex subacute to acute, glabrous. Scape glandular in upper half. Inflorescence paniculate. Fl. pink, Nov to Dec. Sandy loam, granite. Hills, coastal heath.		Habitat present and records within the vicinity < 7.5km
Stylidium falcatum	P2		Perennial, herb, 0.15-0.35(-0.6) m high. Fl. white, Oct to Nov. Sand, gravelly clay loam. Plains, lateritic ridges.		Habitat present and records within the vicinity < 3.75km
Styphelia cymbiformis	P2		Perennial open shrub up to 0.8m high. Fl white, Nov to Dec. brown gravelly loam		Habitat present and records within the vicinity < 3.75km
Synaphea incurva	P3		Clumped, spreading shrub. Fl. yellow, Sep to Nov. Gravelly loam, sandy soils. Slopes.		Habitat present but no records within the vicinity (< 7.5km)
Thelymitra porphyrosticta	P2		Erect up to 0.4m. Fl. Crimson ,purple, gold, April to Aug. Brown, clay loam		Habitat not present
Thomasia multiflora	P1		Spreading shrub, 0.3-1 m high, to 2 m wide. Fl. pink-purple, Sep to Oct. Black sand. Seasonally wet areas, granite outcrops.		Habitat not present and record present from 1901
Thomasia purpurea x solanacea	P1		Shrub, 0.5-0.8 m high. Fl. pink-purple, Nov to Dec or Jan. Grey sand over limestone. Creek sides.		Habitat present but no records within

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Taxon	Conservation Status		Description	PMST Distribution	Likelihood of occurrence
	BC Act	EPBC Act			
					the vicinity (< 7.5km)
Thomasia quercifolia	P4		Shrub, up to 1 m high. Fl. Pink to purple. Grey sand over limestone		Habitat not present
Thomasia solanacea	P4		Erect shrub, 0.5-3 m high. Fl. blue-purple-pink, Sep to Dec. Alluvium, sand over limestone, rocky loam. Coastal areas.		Habitat present and records within the vicinity < 7.5km
Thysanotus gageoides	P3		Perennial, herb (with tuberous roots), to 0.2 m high. Fl. purple, Oct to Nov. Sand, clay, granite, sandstone, laterite.		Habitat present but no records within the vicinity (< 7.5km)
Thysanotus isantherus	P4		Caespitose perennial, herb (with tuberous roots), to 0.15 m high. Fl. purple, Nov to Dec. Granite.		Habitat present and records within the vicinity < 3.75km
Usnea pulvinata	P1		Lichen. Thallus erec up to 0.04m high. granite rock outcrops.		Habitat present but no records within the vicinity (< 7.5km)
Verticordia endlicheriana var. *angustifolia*	P3		Erect shrub, 0.3-0.5 m high. Fl. yellow, Oct to Nov. Sandy clay. Granite outcrops.		Habitat present and records within the vicinity < 7.5km
Verticordia fimbrilepis subsp. *australis*	EN	VU	Slender shrub, 0.2-0.4 m high. Fl. pink, Oct to Dec. Shallow sand, clay loam. Granite outcrops.	Species or species habitat known to occur within area	Habitat present but no records within the vicinity (< 7.5km)

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Appendix C Fauna Likelihood of occurrence assessment

Class	Scientific Name	Common Name	WA Status	C'wealth Status	DBCA Search	PMST Search	PMST attribution	Likelihood of occurrence
BIRD	*Actitis hypoleucos*	Common Sandpiper	MI	MI, MA	x	x	Species or species habitat known occur	Recorded (recorded previously from the study site)
BIRD	*Apus pacificus*	Fork-tailed Swift	MI	MI, MA	x	x	Species or species habitat likely to occur	Likely (habitat present and recent proximal records)
BIRD	*Ardenna carneipes*	Flesh-footed Shearwater, Fleshy-footed Shearwater	VU	MI,MA	x	x	Breeding known to occur within area	Unlikely (habitat not present)
BIRD	*Ardenna grisea*	Sooty Shearwater	MI	MI,MA	x	x	Species or species habitat may occur within area	Unlikely (habitat not present)
BIRD	*Ardenna tenuirostris*	Short-tailed Shearwater	MI	MI,MA	x			Unlikely (habitat not present)
BIRD	*Arenaria interpres*	Ruddy turnstone	MI	MI	x	x	Roosting known to occur within area	Likely (habitat present and recent proximal records)
BIRD	*Atrichornis clamosus*	noisy scrub-bird, tjimiluk	EN	EN	x			Unlikely (habitat not present)
MAMMAL	*Bettongia penicillata ogilbyi*	Woylie, brush-tailed bettong	CR	EN	x			Unlikely (habitat not present)
BIRD	*Botaurus poiciloptilus*	Australasian bittern	EN	EN	x	x	Species or species habitat known to occur within area	Unlikely (habitat not present)
BIRD	*Bubbulcus coromandus (Ardea ibis)*	Cattle Egret	MI	MA		x	Species or species habitat may occur	Unlikely (habitat present but no records)
BIRD	*Calidris acuminata*	Sharp-tailed Sandpiper	MI	MI, MA	x	x	Roosting known to occur within area	Likely (habitat present and recent proximal records)
BIRD	*Calidris alba*	Sanderling	MI	MI,MA	x	x	Roosting known to occur within area	Likely (habitat present and recent proximal records)
BIRD	*Calidris canutus*	Red Knot, Knot	EN	EN	x	x	Species or species habitat known to occur within area	Recorded (recorded previously from the study site)

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Class	Scientific Name	Common Name	WA Status	C'wealth Status	DBCA Search	PMST Search	PMST attribution	Likelihood of occurrence
BIRD	*Calidris ferruginea*	Curlew Sandpiper	CR, MI	CR, MI, MA	x	x	Species or species habitat known to occur within area	Unlikely (habitat not present)
BIRD	*Calidris melanotos*	Pectoral Sandpiper	-	MI, MA		x	Species or species habitat known to occur within area	Unlikely (habitat present but no records)
BIRD	*Calidris ruficollis*	Red-necked stint	MI	MI	x	x	Roosting known to occur within area	Recorded (recorded previously from the study site)
BIRD	*Calidris subminuta*	Long-toed Stint	MI	MI,MA	x			Unlikely (habitat not present)
BIRD	*Calidris tenuirostris*	Great Knot	CR	CR,MI,MA	x	x	Roosting known to occur within area	Recorded (recorded previously from the study site)
BIRD	*Calyptorhynchus banksii naso*	Forest red-tailed black cockatoo	VU	VU	x	x	Species or species habitat known to occur within area	Possible (suitable habitat potential and local records)
BIRD	*Calyptorhynchus baudinii*	Baudin's Cockatoo, Long-billed Black-Cockatoo	EN	EN	x	x	Breeding known to occur within area	Possible (suitable habitat potential and local records)
BIRD	*Calyptorhynchus latirostris*	Carnaby's Black Cockatoo, Short-billed Black-cockatoo	EN	EN	x	x	Breeding known to occur within area	Possible (suitable habitat potential and local records)
BIRD	*Calyptorhynchus* sp. 'white-tailed black cockatoo'	White-tailed black cockatoo	EN	EN	x			Possible (suitable habitat potential and local records)
BIRD	*Catharacta skua*	Great Skua	-	MA		x	Species or species habitat may occur	Unlikely (habitat not present)
BIRD	*Cereopsis novaehollandiae grisea*	Cape Barren Goose, Recherche Cape Barren goose	VU	VU,MA	x	x	Species or species habitat known to occur within area	Unlikely (habitat not present)
BIRD	*Charadrius bicinctus*	Double-banded Plover	MI	MI, MA		x	Roosting known to occur within area	Unlikely (habitat present but no records)
BIRD	*Charadrius leschenaultii*	Greater sand plover, large sand plover	VU	VU,MI,MA	x			Recorded (recorded previously from the study site)
BIRD	*Charadrius mongolus*	Lesser Sand Plover, Mongolian Plover	EN	EN,MI,MA	x	x	Roosting known to occur within area	Unlikely (habitat not present)
BIRD	*Charadrius ruficapillus*	Red-capped Plover		MA		x	Roosting known to occur within area	Unlikely (habitat not present)

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Class	Scientific Name	Common Name	WA Status	C'wealth Status	DBCA Search	PMST Search	PMST attribution	Likelihood of occurrence
BIRD	*Chalcites osculans (Chrysococcyx osculans)*	Black-eared Cuckoo	-	MA		x	Species or species habitat likely to occur within area	Unlikely (habitat not present)
INVERTEBRATE	*Cynotelopus notabilis*	Western Australian pill millipede	EN		x			Very Unlikely (habitat not present)
BIRD	*Dasyornis longirostris*	Western bristlebird	EN	EN	x	x	Species or species habitat likely to occur within area	Unlikely (habitat not present)
MAMMAL	*Dasyurus geoffroii*	Chuditch, Western quoll	VU	VU	x	x	Species or species habitat likely to occur within area	Unlikely (habitat not present)
BIRD	*Diomedea antipodensis*	Antipodean Albatross	MI	VU,MI,MA		x	Foraging, feeding or related behaviour likely to occur within area	Very Unlikely (habitat not present)
BIRD	*Diomedea dabbenena*	Tristan Albatross	CR	EN,MI,MA		x	Species or species habitat may occur within area	Very Unlikely (habitat not present)
BIRD	*Diomedea epomophora*	Southern Royal Albatross	VU	VU,MI,MA		x	Species or species habitat may occur within area	Very Unlikely (habitat not present)
BIRD	*Diomedea exulans*	Wandering Albatross	VU	VU,MI,MA		x	Foraging, feeding or related behaviour likely to occur within area	Very Unlikely (habitat not present)
REPTILE	*Elapognathus minor*	Short-nosed snake	P2		x			Unlikely (habitat not present)
BIRD	*Falco hypoleucos*	Grey Falcon	VU	VU		x	Species or species habitat may occur within area	Unlikely (habitat present but no records)
BIRD	*Falco peregrinus*	Peregrine falcon	OS		x			Unlikely (habitat not present)
MAMMAL	*Falsistrellus mackenziei*	western false pipistrelle, western falsistrelle	P4		x			Very Unlikely (habitat not present)
BIRD	*Gallinago megala*	Swinhoe's Snipe	MI	MI,MA		x	Roosting likely to occur within area	Very Unlikely (habitat not present)
BIRD	*Gallinago stenura*	Pin-tailed Snipe	MI	MI,MA		x	Roosting likely to occur within area	Very Unlikely (habitat not present)
BIRD	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	MI	MA		x	Species or species habitat known to occur within area	Very Unlikely (habitat not present)
BIRD	*Halobaena caerulea*	Blue Petrel		VU,MA		x	Species or species habitat may occur within area	Very Unlikely (habitat not present)
BIRD	*Helicarion castanea*	helicarionid land snail	EX		x			Very Unlikely (habitat not considered to be present)

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Class	Scientific Name	Common Name	WA Status	C'wealth Status	DBCA Search	PMST Search	PMST attribution	Likelihood of occurrence
BIRD	*Heteroscelus brevipes*	Grey-tailed Tattler	MI	MI,MA		x	Roosting known to occur within area	Unlikely (habitat present but no records)
BIRD	*Himantopus*	Pied Stilt, Black-winged Stilt		MA		x	Roosting known to occur within area	Very Unlikely (habitat not considered to be present)
MAMMAL	*Hydromys chrysogaster*	Water-rat, rakali	P4		x			Unlikely (habitat not present)
BIRD	*Hydroprogne caspia*	Caspian Tern	-	MI,MA	x	x	Breeding known to occur within area	Recorded (recorded previously from the study site)
INVERTEBRATE	*Hylaeus globuliferus*	woolybush bee	P3		x			Unlikely (habitat not present)
MAMMAL	*Isoodon fusciventer*	quenda, southwestern brown bandicoot	P4		x			Likely (habitat present and recent proximal records)
BIRD	*Larus novaehollandiae*	Silver Gull		MA		x	Breeding known to occur within area	Unlikely (habitat present but no records)
BIRD	*Larus pacificus*	Pacific Gull	-	MA		x	Breeding known to occur within area	Very Unlikely (habitat not considered to be present)
BIRD	*Leipoa ocellata*	Malleefowl	VU	VU	x			Unlikely (habitat not present)
BIRD	*Limosa lapponica*	Bar-tailed Godwit	MI	MI	x	x	Species or species habitat known to occur within area	Recorded (recorded previously from the study site)
BIRD	*Limosa lapponica menzbieri*	Northern Siberian Bar-tailed Godwit, Russkoye Bartailed Godwit	CR	CR	x	x	Species or species habitat known to occur within area	Unlikely (habitat not present)
BIRD	*Macronectes giganteus*	Southern Giant-Petrel, Southern Giant Petrel	-	EN,MI,MA	x	x	Species or species habitat may occur	Unlikely (habitat not present)
BIRD	*Macronectes halli*	Northern Giant Petrel	-	VU,MI,MA		x	Foraging, feeding or related behaviour likely to occur within area	Unlikely (habitat not present)
MAMMAL	*Macrotis lagotis*	bilby, dalgyte, ninu	VU	VU	x			Unlikely (habitat not present)
BIRD	*Merops ornatus*	Rainbow Bee-eater	-	MA		x	Species or species habitat may occur within area	Unlikely (habitat present but no records)

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Class	Scientific Name	Common Name	WA Status	C'wealth Status	DBCA Search	PMST Search	PMST attribution	Likelihood of occurrence
BIRD	*Motacilla cinerea*	Grey Wagtail	MI	MI		x	Species or species habitat may occur within area	Unlikely (habitat present but no records)
MAMMAL	*Notamacropus eugenii derbianus*	Tammar wallaby	P4		x			Very Unlikely (habitat not considered to be present)
MAMMAL	*Notamacropus irma*	western brush wallaby	P4		x			Unlikely (habitat not present)
BIRD	*Numenius madagascariensis*	Eastern Curlew, Far Eastern Curlew	VU, MI	CR, MI, MA	x	x	Species or species habitat known to occur within area	Possible (suitable habitat potential and local records)
BIRD	*Numenius minutus*	Little Curlew, Little Whimbrel	MI	MI,MA		x	Roosting likely to occur within area	Unlikely (habitat present but no records)
BIRD	*Numenius phaeopus*	Whimbrel	MI	MI,MA	x	x	Roosting known to occur within area	Unlikely (habitat not present)
BIRD	*Oceanites oceanicus*	Wilson's storm-petrel	MI	MI,MA	x			Unlikely (habitat not present)
BIRD	*Onychoprion anaethetus*	Bridled Tern	MI	MI,MA		x	Foraging, feeding or related behaviour likely to occur within area	Unlikely (habitat not present)
BIRD	*Oxyura australis*	Blue-billed duck	P4		x			Unlikely (habitat not present)
BIRD	*Pachyptila turtur subantarctica*	Fairy Prion (southern)		VU		x	Species or species habitat likely to occur within area	Unlikely (habitat not present)
BIRD	*Pandion cristatus (Pandion haliaetus)*	Osprey, eastern osprey	MI	MI	x	x	Breeding known to occur within area	Likely (habitat present and recent proximal records)
MAMMAL	*Parantechinus apicalis*	Dibbler	EN	EN			Species or species habitat known to occur within area	Unlikely (habitat not present)
BIRD	*Pelagodroma marina*	White-faced Storm-Petrel		MA		x	Breeding known to occur within area	Unlikely (habitat not present)
BIRD	*Pezoporus flaviventris*	Western ground parrot	CR	CR	x			Unlikely (habitat not present)
BIRD	*Phaethon rubricauda*	red-tailed tropicbird	MI	MI,MA	x			Unlikely (habitat not present)
MAMMAL	*Phascogale tapoatafa wambenger*	south-western brush-tailed phascogale, wambenger	CD		x			Unlikely (habitat not present)

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Class	Scientific Name	Common Name	WA Status	C'wealth Status	DBCA Search	PMST Search	PMST attribution	Likelihood of occurrence
BIRD	*Philomachus pugnax*	Ruff (reeve)		MI,MA	x			Unlikely (habitat not present)
BIRD	*Phoebetria fusca*	Sooty albatross	EN	VU,MI,MA	x	x	Species or species habitat likely to occur within area	Unlikely (habitat not present)
BIRD	*Plegadis falcinellus*	Glossy ibis	MI	MI,MA	x			Unlikely (habitat not present)
BIRD	*Pluvialis fulva*	Pacific golden plover	MI	MI,MA	x	x	Roosting known to occur within area	Likely (habitat present and recent proximal records)
BIRD	*Pluvialis squatarola*	Grey plover	MI	MI,MA	x	x	Roosting known to occur within area	Recorded (recorded previously from the study site)
MAMMAL	*Potorous gilbertii*	Gilbert's potoroo	CR	CR	x			Unlikely (habitat not present)
MAMMAL	*Pseudocheirus occidentalis*	western ringtail possum, ngwayir	CR	CR	x	x	Species or species habitat known to occur within area	Unlikely (habitat not present)
BIRD	*Psophodes nigrogularis*	western whipbird (western heath)	EN	EN	x	x	Species or species habitat known to occur within area	Unlikely (habitat not present)
BIRD	*Pterodroma macroptera*	Great-winged Petrel		MA		x	Breeding known to occur within area	Unlikely (habitat not present)
BIRD	*Pterodroma mollis*	Soft-plumaged Petrel	-	VU, MI		x	Species or species habitat may occur within area	Unlikely (habitat not present)
BIRD	*Puffinus assimilis*	Little Shearwater	-	MA		x	Breeding known to occur within area	Unlikely (habitat not present)
BIRD	*Puffinus carneipes*	Flesh-footed Shearwater, Fleshy-footed Shearwater		MI,MA		x	Breeding known to occur within area	Unlikely (habitat not present)
BIRD	*Puffinus huttoni*	Hutton's shearwater	EN	MA	x			Unlikely (habitat not present)
BIRD	*Puffinus griseus*	Sooty Shearwater	MI	MI,MA		x	Species or species habitat may occur within area	Unlikely (habitat not present)
BIRD	*Recurvirostra novaehollandiae*	Red-necked Avocet				x	Roosting known to occur within area	Unlikely (habitat not present)
MAMMAL	*Setonix brachyurus*	Quokka	VU	VU	x			Unlikely (habitat not present)
BIRD	*Stercorarius antarcticus lonnbergi*	Brown Skua, Subantarctic skua	P4		x			Unlikely (habitat not present)

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Class	Scientific Name	Common Name	WA Status	C'wealth Status	DBCA Search	PMST Search	PMST attribution	Likelihood of occurrence
BIRD	*Stercorarius maccormicki*	South polar skua	MI	MI,MA	x			Unlikely (habitat not present)
BIRD	*Stercorarius parasiticus*	Arctic jaeger, Arctic Skua	MI	MI,MA	x			Unlikely (habitat not present)
BIRD	*Sterna anaethetus*	Bridled Tern	MI	MI,MA		x	Foraging, feeding or related behaviour likely to occur within area	Unlikely (habitat not present)
BIRD	*Sterna bergii*	Crested Tern	MI	MI,MA		x	Breeding known to occur within area	Recorded (recorded previously from the study site)
BIRD	*Sterna caspia*	Caspian Tern	MI	MI,MA		x	Breeding known to occur within area	Recorded (recorded previously from the study site)
BIRD	*Sternula nereis*	Australian Fairy Tern	VU	VU		x	Foraging, feeding, or related behaviour known to occur within area	Unlikely (habitat present but no records)
BIRD	*Thalassarche carteri*	Indian, Yellow-nosed Albatross	EN	VU,MI,MA	x	x	Species or species habitat likely to occur within area	Unlikely (habitat not present)
BIRD	*Thalassarche cauta*	Shy Albatross	EN	MI,MA	x	x	Foraging, feeding or related behaviour likely to occur within area	Unlikely (habitat not present)
BIRD	*Thalassarche chlororhynchos*	Atlantic, yellow-nosed albatross	VU	MI,MA	x			Unlikely (habitat not present)
BIRD	*Thalassarche impavida*	Campbell Albatross, Campbell Black-browed Albatross	VU	VU,MI,MA		x	Species or species habitat may occur within area	Unlikely (habitat not present)
BIRD	*Thalassarche melanophris*	Black-browed Albatross	EN	MI,MA	x	x	Foraging, feeding or related behaviour likely to occur within area	Unlikely (habitat not present)
BIRD	*Thalassarche steadi*	White-capped Albatross	VU	VU,MI,MA		x	Species or species habitat may occur within area	Unlikely (habitat not present)
BIRD	*Thalasseus bergii*	Greater Crested Tern	MI	MI,MA	x	x	Breeding known to occur within area	Recorded (recorded previously from the study site)
BIRD	*Thinornis rubricollis*	Hooded Plover	P4		x	x	Species or species habitat known to occur within area	Likely (habitat present and recent proximal records)

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Class	Scientific Name	Common Name	WA Status	C'wealth Status	DBCA Search	PMST Search	PMST attribution	Likelihood of occurrence
BIRD	*Tringa brevipes*	Grey-tailed Tattler	P4	MI	x	x	Roosting known to occur within area	Possible (suitable habitat potential and local records)
BIRD	*Tringa glareola*	Wood sandpiper	MI	MI,MA	x			Unlikely (habitat not present)
BIRD	*Tringa nebularia*	Common Greenshank, Greenshank	MI	MI,MA	x	x	Species or species habitat known to occur within area	Recorded (recorded previously from the study site)
BIRD	*Tringa stagnatilis*	Marsh Sandpiper, Little Greenshank	MI	MI,MA		x	Roosting known to occur within area	Unlikely (habitat not present)
INSECT	*Trioza barrettae*	Banksia brownii plant louse	EN	EN	x	x	Species or species habitat known to occur within area	Possible (suitable habitat potential and local records)
BIRD	*Tyto novaehollandiae*	Masked Owl (southwest)	P3					Unlikely (habitat not present)
BIRD	*Xenus cinereus*	Terek Sandpiper	MI	MI,MA	x	x	Roosting known to occur within area	Unlikely (habitat not present)
INVERTEBRATE	*Zephyrarchaea mainae*	Main's assassin spider	VU					Unlikely (habitat not present)

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Appendix D Ecological Report

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Woolstores Place Ecological Surveys 2023

Rowe Group

Report

JBS&G 65310 | 161,820

22 August 2024

JBS&G

We acknowledge the Traditional Custodians of Country throughout Australia and their connections to land, sea and community.

We pay respect to Elders past and present and in the spirit of reconciliation, we commit to working together for our shared future.

Executive Summary

JBS&G Australia Pty Ltd (JBS&G) were commissioned to undertake a Reconnaissance flora and vegetation survey and Basic fauna survey of nine lots on Woolstores Place, Mt Elphinstone for the development of a Local Structure Plan.

The surveys were undertaken from 25-28 October 2023 by an experienced botanist from JBS&G and an experienced zoologist from Kingfisher Consulting Pty Ltd.

No significant constraints were identified with regards to flora and vegetation, with the majority of the Survey Area having been previously cleared, such that 97% of the Survey Area was in Completely Degraded condition in accordance with Keighery's (1994) scale. A small, and avoidable, section of the Survey Area (0.22 ha) contained part of an EPBC Act listed threatened ecological community, *Subtropical and Temperate Coastal Saltmarsh.* The remaining remnant native vegetation in the Survey Area was likely to be groundwater dependant with the entirety of the site being low-lying/wetland and a small lake being present. Only 27 native flora species were identified in the Survey Area.

The fauna survey identified four listed fauna species, including the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed Western Ringtail Possum (Critically Endangered, 1.4 ha of habitat) and *Biodiversity Conservation Act 2016* (BC Act) Quenda (Priority 4, 8.24 ha of habitat), which were both resident, and Migratory birds (listed under International Agreements) in large numbers utilising the adjacent mudflats, including the EPBC Act listed Fairy Tern (Vulnerable/Migratory). The presence of some listed fauna species (e.g. fish and invertebrates) was not able to be assessed without a targeted survey.

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1. Introduction

Mainbeam Pty Ltd (Mainbeam) are developing a Local Structure Plan (LSP) over nine lots on Woolstores Place, Mount Elphinstone, located within the City of Albany. The LSP area (the 'Survey Area') includes Mainbeam landholdings, as well as other State, Commonwealth, and privately owned land, and is depicted in Figure 1.1. The proposed development's focus will primarily be on the future use and development of the Mainbeam landholdings, exploring a mixture of tourist and quality medium to high density residential, with non-residential commercial land uses considered in close proximity to the rail corridor and future road interchange.

1.1 Survey/Study Area (Delete as applicable)

The Survey Area is located approximately 3.5 km west of the Albany Central Business District in City of Albany and covers a land area of 16.77 ha within the area bound by Frenchman Bay Road, the Princess Royal Harbour waterfront, and the Princess Royal Drive (Figure 1.1).

1.2 Scope of Work

The proposed scope of works for ecological surveys of the LSP includes:

- Reconnaissance-level flora and vegetation survey;
- Targeted flora survey to record the presence of any conservation – listed fauna taxa identified from the desktop study as having 'Likely' potential to occur;
- Basic fauna survey, including a targeted survey for conservation- listed fauna taxa, including threatened bird species known from, or considered 'Likely' to occur at the site; and
- Threatened and Priority Ecological Community survey to evaluate species composition and vegetation condition against criteria contained within the approved Subtropical and Temperate Coastal Saltmarsh TEC conservation advice (TSSC, 2013).

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Legend

- Survey Area
- Cadastral boundary
- Highway
- Major road
- Minor road
- Track

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Client: ROWE Group

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Scale 1:8,000 at A4

0 100 200
metres

Coord. Sys. GDA2020 MGA Zone 50

Woolstores Place, Albany, WA

SURVEY AREA AND REGIONAL LOCATION

FIGURE 1.1

File Name: C:\Users\droberts\JBS&G Australia\JBS&G - DCS - Internal - Documents\Projects\Rowe\65310 Woolstores Ecological Surveys\GIS\02_MapProjects\65310 Woolstores Ecological Surveys R01.aprx
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2. Existing Environment

2.1 Biogeography

The Survey Area occurs in the South-west Botanical Province, in the Southern Jarrah Forest subregion, of the Jarrah Forest region under the Interim Biogeographic Regionalisation for Australia (IBRA) (DEE, 2012).

The Southern Jarrah Forest includes forests south of Collie which slope gently towards the south coast. The region is characterised by Jarrah-Marri (*Eucalyptus marginata-Corymbia calophylla*) forest in the west where rainfall is higher, grading to drier Marri and Wandoo (*Eucalyptus wandoo*) forest in the east (Hearn, et al., 2002).

Within this region, granite outcrops, riparian areas, peaty wetlands act as refugia for species with restricted distributions and/or relict taxa representative of historically wetter and milder climates (Hearn, et al., 2002).

2.2 Climate

The Southern Jarrah Forest sub-region has a warm Mediterranean climate with mild, dry summers and cool, wet winters (Beard, 1990).

The Albany weather station (Station 9500) is positioned approximately 1.5 km from the Survey Area and recorded rainfall data between 1877 and 2024 and temperature data between 1880 and 2024.

The average annual rainfall at Albany was 924.7 mm, with the highest monthly rainfall occurring from May to September. The highest recorded rainfall of 1395.2 mm was received in 1955. 2023 received 863.1 mm of rainfall, approximately 93% of the long-term average (BOM, 2024).

The average monthly maximum temperature at Albany ranges from 15.8 °C in July to 22.9 °C in February. Average monthly minimum temperatures range from 8.2 °C in July to 15.6 °C in February (BOM, 2024).

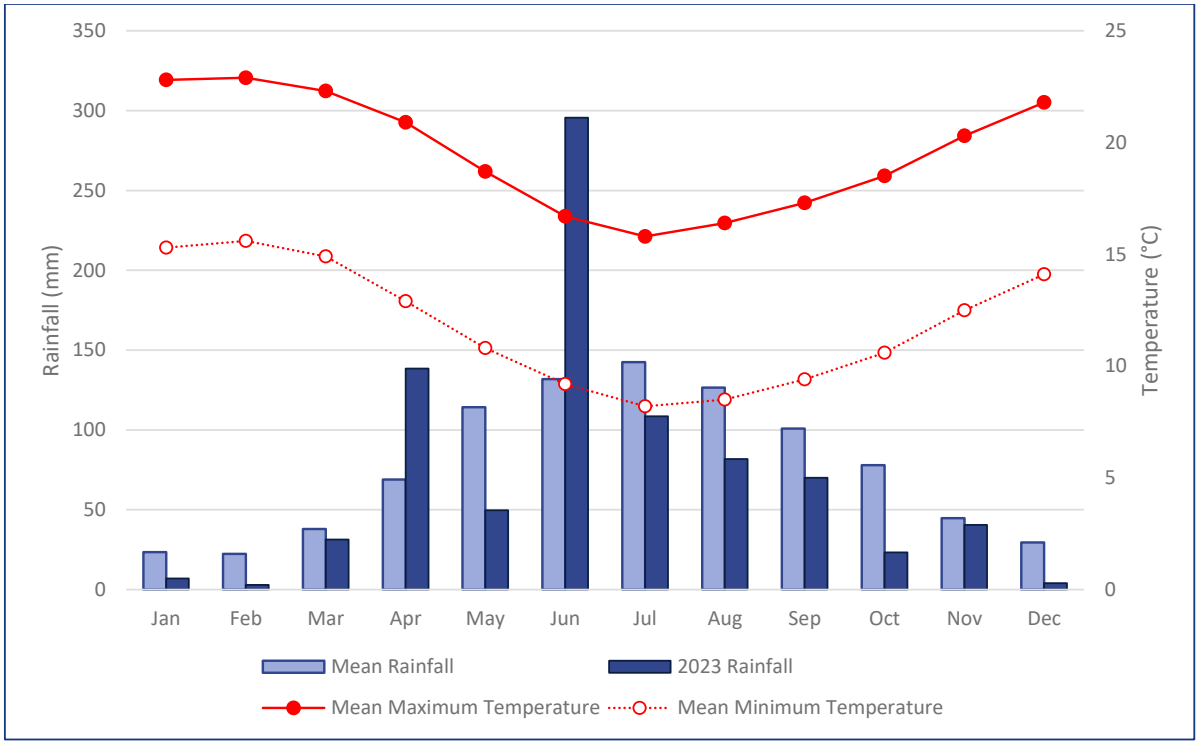

Figure 2.1 Climate data for the Albany weather station (station 9500)

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2.3 Soils and Landforms

2.3.1 Soil-landscape Systems

Two soil-landscape systems are mapped in the Survey Area, the Gardner granite phase and the Owingup subsystem (DPIRD, 2018). Department of Primary Industry and Regional Development (DPIRD) spatial data does not cover the full extent of the Survey Area, so area of this mapping does not tally up to 16.77 ha.

Table 2.1 Soil-landscape systems mapped within the Survey Area

Land System Code System Name	Description	Area (ha)	Proportion of the Survey Area
242MmGAg Gardner granite phase	Granite outcrop.	0.14	0.92 %
242TbOW Owingup subsystem	Plains with swamps, lunettes and dunes. Yellow solonetzic soils, organic loams and diatomaceous earth; Wattle-Paperbark thickets, Teatree heath and reeds. Podzols on dunes; Banksia-Sheoak woodland.	15.55	99.08 %

2.3.2 Topography

The Survey Area is low-lying and occurs at less than 10 m above sea level. The southernmost portion of the Survey Area is an artificial landform (Plate 1, Figure 2.2), with historic aerial photography indicating that this area was originally saltmarsh, with land reclaimed for the Albany Woolstores between 1954 and 1977 (Landgate, 2024). The northern portion of the Survey Area was cleared but not filled historically.

Plate 1 An artificial rock-wall at the southern side of the Survey Area

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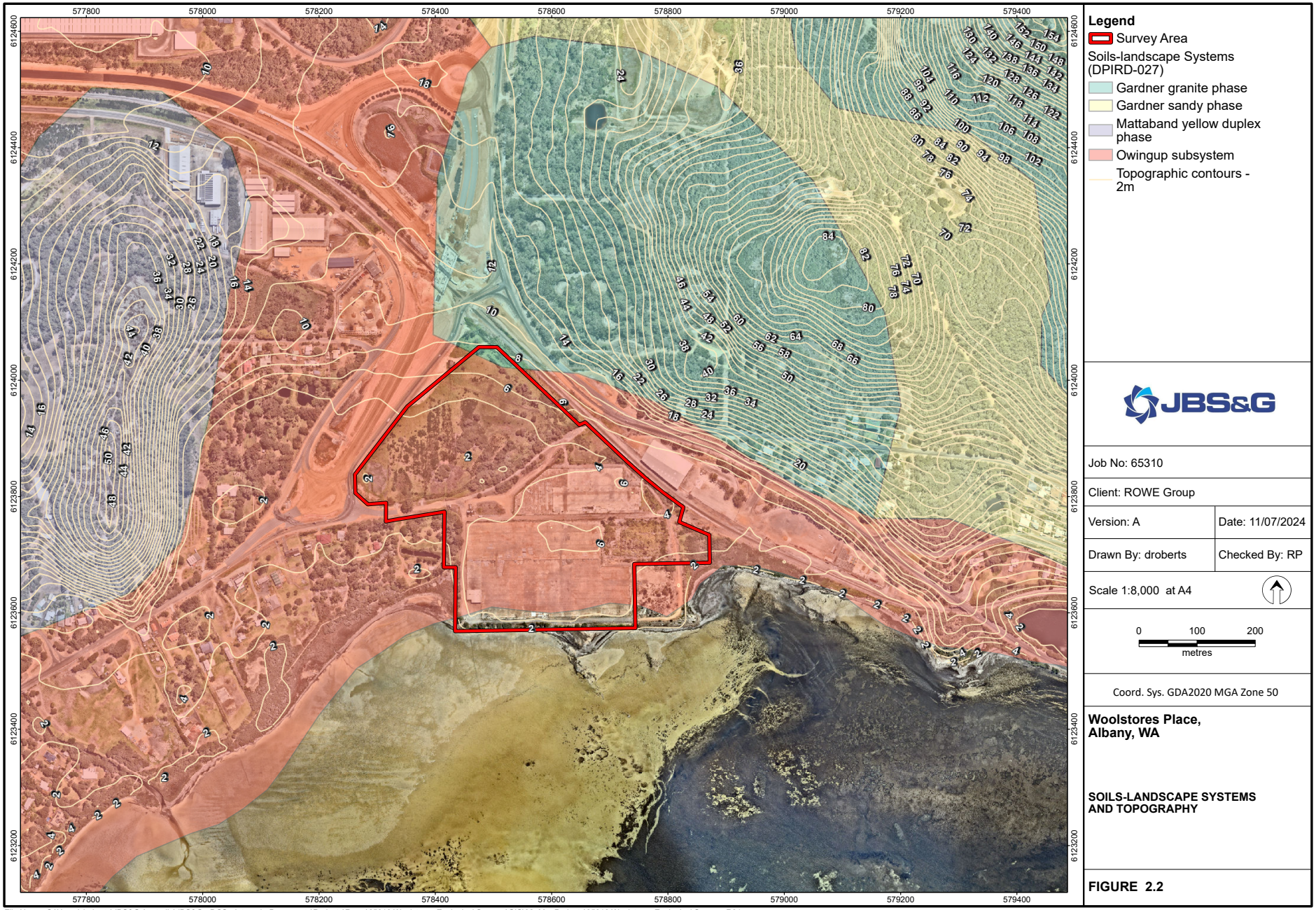

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2.4 Inland Waters

2.4.1 Surface Water

The Survey Area lies adjacent to, and extends into, the Princess Royal Harbour. The Survey Area is only slightly above sea level and norther parts of the site contain swamp. No fine scale contour mapping is available for the Survey Area.

The Survey Area does not occur near any important wetlands (DCCEEW, 2022; DBCA, 2017a; DBCA, 2017b).

2.4.2 Groundwater

The Survey Area occurs in the Princess Royal Harbour catchment of the Albany Coast basin. The Survey Area falls within the Karri groundwater sub-area (DWER, 2017). Little information is available about the coastal portions of this sub-area.

2.5 Regional Vegetation

On 10 November 2023, Australia's environment ministers agreed on 6 priority areas for national targets under Australia's Strategy for Nature. These included protecting and conserving 30 % of Australia's land and 30 % of Australia's oceans by 2030 (DCCEEW, 2024).

One pre-European vegetation association coincides with the Survey Area, Albany – 3 (Table 2.2 and Figure 2.4). More than 30 % of the pre-European extent of Albany – 3 remains at a local and regional scale.

Table 2.2 Pre-European vegetation associations/sub-associations and their extent

Vegetation Sub-Association	Scale	Pre-European Extent (ha)	Current Extent (ha)	% Remaining
Albany - 3 Medium forest; jarrah-marri	Western Australia	2,661,404.62	1,803,437.48	67.76
	Jarrah Forest IBRA Region	2,390,591.54	1,604,101.56	67.10
	Southern Jarrah Forest IBRA Sub-region	1,482,491.85	880,655.65	59.40
	City of Albany	50,509.32	16,024.66	31.73

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Legend

- Survey Area
- Cadastral boundary
- Topographic contours - 2m

Hydrography, linear (DWER-031)

- Drain - minor
- Lake - perennial
- Lake - artificial
- Earth Dam
- Highway
- Major road
- Minor road
- Track

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SOILS-LANDSCAPE SYSTEMS AND TOPOGRAPHY

FIGURE 2.3

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Legend

Survey Area

Pre-European Vegetation (DPIRD-006)

ALBANY_128

ALBANY_3

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Scale 1:8,000 at A4

0 100 200

metres

Coord. Sys. GDA2020 MGA Zone 50

Woolstores Place, Albany, WA

PRE - EUROPEAN VEGETATION

FIGURE 2.4

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2.6 Previous Surveys

The *Albany Regional Vegetation Survey* (Sandiford & Barrett, 2010) spanned 124,415 ha extending 30 km east and west of Albany and 20 km to the north. The survey defined 67 vegetation units, including several communities now listed at a State or Commonwealth level. More than 800 species were recorded during the survey, including 49 taxa then listed at a State or Commonwealth level (Sandiford & Barrett, 2010). The regional vegetation map produced by the *Albany Regional Vegetation Survey* did not show the Survey Area as being vegetated, but identified *Juncus kraussii* Sedgeland, Peppermint Low Forest and Coastal *Melaleuca cuticularis* Low Forest as occurring to either side of the Survey Area (Sandiford & Barrett, 2010).

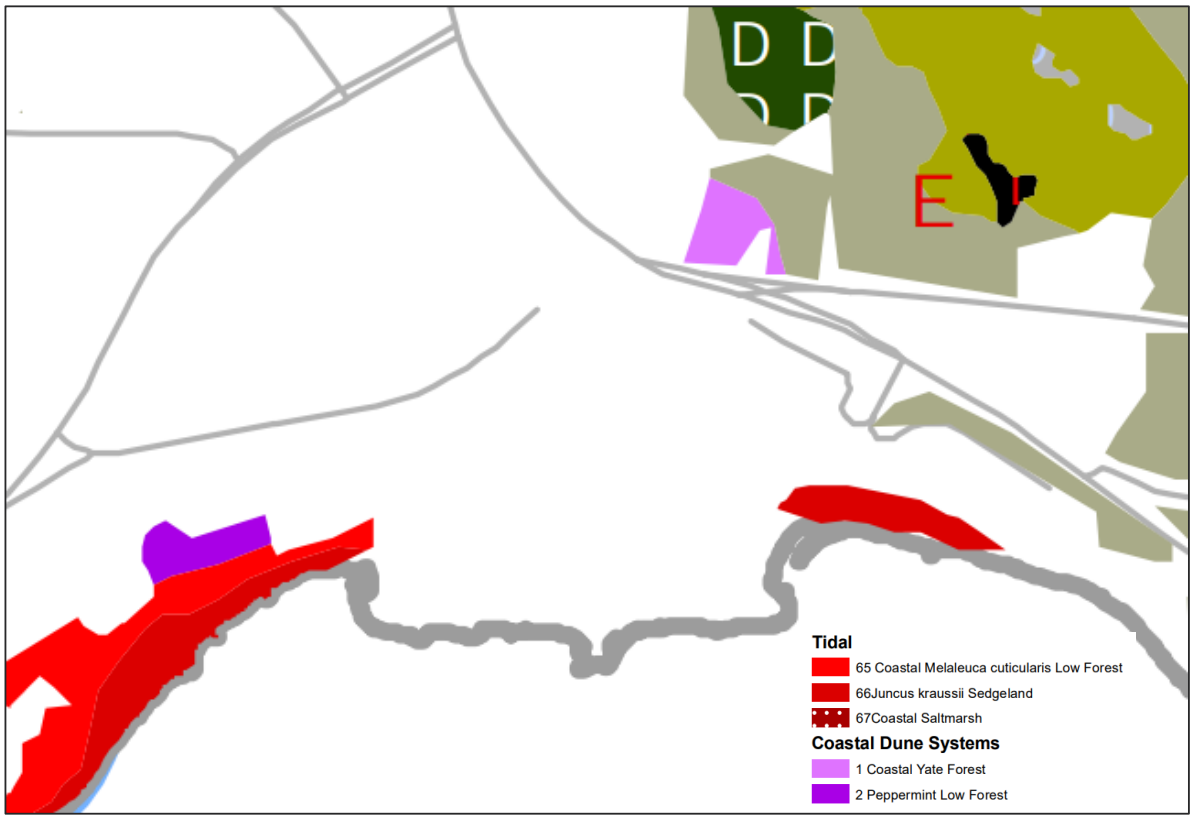

Plate 2 Albany Regional Vegetation Survey vegetation map

A biological survey was undertaken north of the Survey Area as part of studies undertaken for the Albany Ring Road: *Biological Survey: Albany Ring Road* (Southern Ecology, 2020). This survey incorporated the northern portion of the Survey Area. Southern Ecology (2020) identified most of this area as Completely Degraded *"isolated plants (pasture and herbaceous weeds with isolated plants)"* with small areas of Yate (*Eucalyptus cornuta*) woodland and *Melaleuca preissiana* low woodland (Plate 3). Of the area identified as Yate woodland, only a single tree lies within the Survey Area.

Southern Ecology (2020) considered *Melaleuca preissiana* low woodland to be regionally significant as a wetland habitat. They also noted the presence of the Subtropical and Temperate Coastal Saltmarsh Threatened Ecological Community (TEC) (Vulnerable) approximately 100 m from Southern Ecology's survey on the margin of Princess Royal Harbor.

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Plate 3 Vegetation mapping by Southern Ecology (2020)

No listed flora were identified in the Survey Area by Southern Ecology, who recorded four Priority flora taxa in their broader survey:

- *Thysanotus isantherus* (P4) approximately 200 m east of the Survey Area;
- *Boronia crassipes* (P3);
- *Andersonia* sp. Jamesii (J. Liddelow 84) (P4); and
- *Synaphea incurva* (P3).

Southern Ecology also recorded five significant fauna species:

- Carnaby's Black Cockatoo (*Zanda latirostris*) (T-EN)
- Baudin's Black Cockatoo (*Zanda baudinii*) (T-EN)
- Forest Red-tailed Black Cockatoo (*Calyptorhychus banksii naso*) (T-VU)
- Western Ringtail Possum (*Pseudocheirus occidentalis*) (T-CR)
- Southern Brown Bandicoot (*Isoodon obesulus fusciventer*) (P4)

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2.7 Significant Ecological Communities

2.7.1 Database Searches

A search of Department of Biodiversity, Conservation and Attractions (DBCA) flora communities and fauna databases and DCCEEW's Protected Matters Search Tool for listed ecological communities occurring within 15 km of the Survey Area . Four significant ecological communities were listed by DBCA as occurring within 15 km of the Survey Area

Table 2.3 Significant ecological communities listed in databases as occurring near the Survey Area

ID	Community	State	Cth
Coastal *Melaleuca incana/Taxandria juniperina*	Coastal *Melaleuca incana / Taxandria juniperina* Shrubland/Closed Forest	Priority 1	Not listed
Banksia littoralis/Melaleuca incana	*Banksia littoralis* woodland / *Melaleuca incana* Shrubland	Priority 1	Not listed
Astartea scoparia Swamp Thicket	*Astartea scoparia* Swamp Thicket	Priority 1	Not listed
126 *Banksia coccinea* thicket	Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia • *Banksia coccinea* Shrubland/*Eucalyptus staeri*/Sheoak Open Woodland (Community 14a - Sandiford & Barrett 2010) (all/or portion in EPBC listed Kwongkan community)	Priority 1	Endangered
118	*Subtropical and Temperate Coastal Saltmarsh*	Priority 3	Vulnerable
174	*Empodisma peatlands of southwestern Australia*	Not listed[1]	Vulnerable

2.7.2 Groundwater Dependent Ecosystems

Geoscience Australia describes Groundwater Dependent Ecosystems as those that rely on groundwater for some, or all, of their water requirements (Geoscience Australia, 2023). This can broadly apply to many ecosystems in Australia, so six types of GDEs have been identified in Australia:

- Terrestrial vegetation that relies on the availability of shallow groundwater;
- Wetlands such as paperbark swamp forests and mound springs;
- River baseflow systems where groundwater discharge provides a significant baseflow component to the river;
- Aquifer and cave ecosystems where life exists independent of sunlight;
- Terrestrial fauna, both native and introduced species, that rely on groundwater as a source of drinking water; and
- Estuarine and near-shore marine systems, such as coastal mangroves, salt marshes and sea-grass beds, which rely on the submarine discharge of groundwater.

These have been categorised into three categories (BOM, 2017):

- Aquatic ecosystems which rely on the surface expression of groundwater, such as rivers, wetlands and springs (this can also include marine and estuarine ecosystems);

[1] DBCA advise that a number of South-west communities have peat associations that may be listed as other ecological communities at a State level.

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- Terrestrial ecosystems which rely on the subsurface presence of groundwater, including groundwater dependent terrestrial vegetation; and
- Subterranean ecosystems including cave and aquifer ecosystems.

Aquatic and subterranean environments are not included in flora and vegetation surveys for Environmental Impact Assessment so are not covered by this report.

Regionally, the following vegetation has been identified as Groundwater Dependent:

- Base-flow ecosystems in south-western Western Australia (Hatton & Evans, 1998);
- The jarrah forest and Banksia woodlands of south-western Western Australia (limited dependence) (Hatton & Evans, 1998);
- Coastal mangrove and salt marsh ecosystems (limited dependence) (Hatton & Evans, 1998);
- The near-shore stromatolite systems of coastal Western Australia (Hatton & Evans, 1998);
- Karstic groundwater ecosystems of Exmouth Cape, Yanchep Caves, the Nullarbor and elsewhere (Hatton & Evans, 1998); and
- Karst ecosystems including those on the Nullarbor (Hatton & Evans, 1998);

2.8 Significant Flora

Flora, or populations of flora, may be considered significant for a range of reasons, including:

- Conservation dependent taxa (including those identified as a threatened or priority taxa);
- Being locally endemic, geographically restricted or associated with a restricted habitat type, including phreatophytic species;
- Novel, hybrid or taxonomically unusual taxa;
- Geographically isolated populations and range extensions;
- Bush tucker, bush medicine species and culturally important species; and
- Keystone species or those which provide critical habitat for fauna species.

2.8.1 Conservation Listed Flora

2.8.1.1 Database Searches

A search of DBCA databases and the Protected Matters Search Tool identified 77 conservation listed flora occurring within 15 km of the Survey Area (Figure 2.5). Of these, a likelihood assessment (Appendix C) identified 29 taxa as likely to occur within the Survey Area based on nearby records (within 5 km) and a desktop assessment of potential habitats present. A further 25 taxa were considered to possibly occur in the Survey Area based on their preferred habitats but were not known to occur in the immediate vicinity of the Survey Area (Table 2.4). Two recently State-listed threatened species (upgraded 6 October 2023) were not yet listed under the EPBC Act, *Conospermum quadripetalum* and *Isopogon buxifolius* subsp. *buxifolius*.

Table 2.4 Summary of likelihood assessment

State Listing (State of Western Australia, 2023)	Likely	Possible	Unlikely	Total
Critically Endangered (CR)	4	0	2	**6**
Endangered (EN)	0	4	3	**7**
Vulnerable (VU)	2	0	3	**5**
Priority 1 (P1)	3	1	2	**6**

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State Listing (State of Western Australia, 2023)	Likely	Possible	Unlikely	Total
Priority 2 (P2)	7	5	2	**14**
Priority 3 (P3)	5	11	5	**21**
Priority 4 (P4)	8	6	6	**20**
Total	**29**	**27**	**23**	**79**

Taxa considered likely to occur, and their WA conservation status, were:

Threatened Flora:

- *Banksia brownii* (CR)
- *Caladenia harringtoniae* (VU)
- *Calectasia cyanea* (CR)
- *Conospermum quadripetalum* (CR)
- *Conostylis misera* (VU)
- *Isopogon uncinatus* (CR)

Priority Flora:

- *Acacia ataxiphylla* subsp. *ataxiphylla* (P3)
- *Adenanthos x cunninghamii* (P4)
- *Agrostocrinum scabrum* subsp. *littorale* (P2)
- *Boronia crassipes* (P3)
- *Chorizema carinatum* (P3)
- *Conospermum spectabile* (P2)
- *Drosera paleacea* (P1)
- *Gahnia sclerioides* (P4)
- *Gonocarpus pusillus* (P4)
- *Lepidium pseudotasmanicum* (P4)
- *Leucopogon alternifolius* (P3)
- *Leucopogon bracteolaris* (P2)
- *Lysinema lasianthum* (P4)
- *Microtis pulchella* (P4)
- *Microtis quadrata* (P4)
- *Prasophyllum paulinae* (P1)
- *Stylidium articulatum* (P2)
- *Stylidium falcatum* (P2)
- *Styphelia cymbiformis* (P2)
- *Synaphea preissii* (P3)
- *Thelymitra porphyrosticta* (P2)
- *Thomasia multiflora* (P1)
- *Thomasia solanacea* (P4)

2.8.1.2 Nearby Surveys

No additional flora were identified by Southern Ecology (2020) that were not captured by database searches. Of the four significant flora taxa identified by Southern Ecology, *Synaphea incurva* (P3) occurred within 5 km of the Survey Area, however its preference for slopes means it's unlikely to occur within the Survey Area.

2.8.2 Other Significant Flora

2.8.2.1 Phrase Name Species

'Phrase name' flora taxa are those which have not yet been formally named and described. Approximately 59 phrase name flora taxa occur within Shire of Albany (WAHerb, 1998-). This number fluctuates as species are formally named and described, and as new species are identified.

2.8.2.2 Geographically Restricted Flora

Taxa which rely on granite outcropping are usually geographically restricted. The Great Southern region is known for its granite outcropping, and approximately 111 native flora taxa were associated with granite outcropping in the Shire of Albany (WAHerb, 1998-). This did not include phrase name species which have not yet had habitat information input to Florabase.

A small section of the Survey Area is mapped as granite outcrop (DPIRD, 2018).

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2.8.2.3 Groundwater Dependent Flora

Phreatophytic species are reliant on access to groundwater reserves for persistence and are thus considered to be groundwater dependent. Groundwater dependent species may be 'obligate' phreatophytes, dependent on free access to groundwater, or 'facultative' phreatophytes, which require access to groundwater resources when the soil surface moisture is depleted but are able to utilise surface water during periods of rainfall (Nevill, et al., 2010).

Regionally, taxa known to occur only in wetlands or riparian vegetation should be treated as obligate phreatophytes, while many taxa and communities may be facultative phreatophytes.

2.8.2.4 Flora Associated with Significant Vegetation

Locally the following flora can be considered significant as indicators of Threatened and Priority Ecological Communities:

- *Melaleuca incana*
- *Taxandria juniperina*
- *Banksia littoralis*
- *Astartea scoparia*
- *Banksia coccinea*
- *Eucalyptus staeri*
- *Allocasuarina* spp.
- Proteaceae spp.
- Saltmarsh species (Chenopod species, *Suaeda australis, Threlkeldia diffusa, Juncus* spp. etc.)
- *Empodisma gracillimum*

2.9 Significant Fauna

One hundred and one listed fauna species were identified by database searches as potentially occurring in the Survey Area (excluding purely marine species such as marine fish, sharks, turtles and whales). This included 40 listed as threatened under the EPBC Act, ten only listed as threatened under the BC Act, and 45 listed as Migratory or under an International Agreement (Table 2.5, Figure 2.6). A full assessment of the potential for these taxa to occur in the Survey Area is provided in Appendix B.

Table 2.5 Number of listed species potentially occurring in the Survey Area

Class	Western Australia Only					Commonwealth						
	P1	P2	P3	P4	T	CR	EN	EN/MI	MI	VU	VU/MI	Total
Bird			1	3	3	2	8	4	35	11	5	**72**
Invertebrate			1		3		1			1		**6**
Mammal				5	3	2	3	1		3		**17**
Reptile		1										**1**
Fish					1		2					**2**
Total	**0**	**1**	**2**	**8**	**10**	**4**	**15**	**5**	**35**	**15**	**5**	**101**

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Legend

Survey Area

Threatened and Priority Ecological Communities

- *Astartea scoparia* Swamp Thicket (Priority 1)
- *Banksia coccinea* Shrubland *Eucalyptus staeri* Sheoak Open Woodland (Priority 1)
- *Banksia littoralis* woodland / Melaleuca incana Shrubland, (Priority 1)
- Coastal *Melaleuca incana* / *Taxandria juniperina* Shrubland/Closed Forest (Priority 1)
- Subtropical and Temperate Coastal Saltmarsh (Priority 3)

Significant Flora Conservation code

- Threatened
- Priority 1
- Priority 2
- Priority 3
- Priority 4

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Job No: 65310

Client: ROWE Group

Version: A | Date: 11-Jul-2024

Drawn By: droberts | Checked By: RP

Scale 1:50,000 at A3

0 1 2
Kilometers

Coord. Sys. GDA2020 MGA Zone 50

Woolstores Place, Albany, WA

DATABASE SEARCH

FIGURE 2.5

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Image Reference: SLIP_Public_Services_Locate: www.nearmap.com© - Imagery Date: 28. May 2022.

Legend

- Survey Area

Conservation status

- Critically endangered
- Endangered
- Vulnerable
- Extinct
- Conservation dependant
- Other specifically protected
- Migratory
- P2
- P3
- P4
- Highway
- Major road

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Job No: 65310	
Client: ROWE Group	
Version: A	Date: 16-Aug-2024
Drawn By: ianandagoda	Checked By: RP

Scale 1:180,000 at A3

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Kilometers

Coord. Sys. GDA2020 MGA Zone 50

Woolstores Place, Albany, WA

FAUNA DATABASE SEARCH

FIGURE 2.6

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Image Reference: SLIP_Public_Services_Locate:

3. Methods

3.1 Personnel

The field assessment of the Survey was led by an experienced botanist from JBS&G and an independent consultant Zoologist (Table 3.1), with more than 5 years' experience in the bioregion as required by EPA guidance.

Table 3.1 Key Personnel

Name	Experience	Role	Permits
Rachael Pratt (JBS&G)	21 years	Botanist	FB62000141-2 (13 Sep 2022-12 Sep 2025) TFL 2223-0029 (26 Jul 2022-31 Jul 2025)
Jeff Turpin (Kingfisher Environmental Consulting)	22 years	Zoologist	n/a
Frank Obbens	31 years	Taxonomist	n/a

3.2 Desktop Assessment

Requests were made to DCCEEW and DBCA for data from key databases to generate a list of significant vascular flora, fauna and ecological communities previously recorded within, and in the vicinity of, the Survey Area. A subset of these results was generated based on a buffer distance of 20 km from the Survey Areas (Table 3.2). This information was supplemented with additional data on broad fauna and flora assemblage within a 150 m buffer of the Survey Area.

Table 3.2. Database searches

Data Custodian	Database	Search Buffer
DCCEEW	Protected Matters Search Tool (flora records on MNES protected under the EPBC Act.)	20 km
DBCA	Threatened and Priority Ecological Communities	20 km
DBCA	Threatened (Declared Rare) and Priority Flora (TPFL)	20 km
DBCA	WA Herbarium	20 km
DBCA	Threatened and Priority Fauna	20 km
DBCA	Black Cockatoo Roosting Sites (Great Cocky Count)	20 km
DBCA	White-tailed Black Cockatoo Breeding Site Locations	20 km
BirdLife	BirdData	150 km
DBCA	Naturemap (Records from the Western Australian Museum (WAM) and Department of Biodiversity, Conservation and Attractions (DBCA) databases, including historical data and Threatened and Priority species in WA)	150 km
DCCEEW	Protected Matters Search Tool (fauna records on MNES protected under the EPBC Act.)	150 km
CSIRO	Atlas of Living Australia (fauna records from Australian museums and conservation/research bodies.)	150 km

Species identified by database searches and nearby survey work were assessed for their likelihood of occurring in the Survey Area based on proximity to the Survey Area and the presence of suitable habitat (Table 3.3 and Table 3.4).

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Table 3.3 Flora likelihood assessment categories

Likelihood	Definition
Present	The taxon has been recorded within the Survey Area.
Likely	The Survey Area contains suitable habitat for the taxon and it is likely the taxon may occur based on presence of a recent historical record close to (within 5 km) the Survey Area.
Possible	The Survey Area contains suitable habitat for the taxon but there is no other information to suggest that the taxon may occur within or close to the Survey Area, or habitat information is lacking for the taxon.
Unlikely	The Survey Area does not contain suitable habitat for the taxon, regional records suggest the taxon does not occur near the Survey Area , or the Survey Area contains suitable habitat for the taxon within which thorough targeted searches were completed and conclusion has been made that the taxon is unlikely to be present.
Absent	Habitats present within the Survey Area preclude the possibility of this taxon occurring. E.g. aquatic taxa at a Survey Area where no seasonally inundated areas occur.

Table 3.4 Fauna likelihood assessment categories, adapted from Bamford Consulting Ecologists (2024)

Likelihood	Definition
Resident	Taxa with a population permanently present in the Survey Area.
Regular migrant or visitor	Taxa that occur within the Survey Area regularly in at least moderate numbers, such as part of an annual cycle.
Irregular visitor	Taxa that occur within the Survey Area irregularly such as nomadic and irruptive species. The length of time between visitations could be decades but when the species is present, it uses the Survey Area in at least moderate numbers and for some time.
Vagrant	Taxa that occur within the Survey Area unpredictably, in small numbers and/or for very brief periods. Therefore, the Survey Area is unlikely to be of importance for the species.
Absent	No habitat occurs within the Survey Area or the Survey Area is outside the known range of the taxon.
Locally extinct	Taxa that would have been present but has not been recently recorded in the local area and therefore is almost certainly no longer present in the Survey Area.
(Other)	Specific comment with respect to likelihood.

3.3 Field Survey

3.3.1 Survey Rationale

JBS&G plan and implement flora and vegetation surveys to comply with legislation, regulations and standards detailed in the guidelines required for environmental impact assessment (EIA). A reconnaissance survey was chosen for this site with consideration to its clearing and survey history. The site had been previously cleared, included an artificial landform, and was part of the *Biological Survey: Albany Ring Road* (Southern Ecology, 2020). With this in mind, a Reconnaissance survey in combination with targeted flora surveys, an assessment of potential TECs and a basic fauna survey were considered appropriate.

3.3.2 Reconnaissance Flora Survey

The reconnaissance flora and vegetation survey was undertaken from 25-27 October 2023. The Survey Area was traversed predominantly on foot, with an attempt made to visit all vegetation units within the Survey Area based on observations of aerial photography.

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For each vegetation unit, a description was prepared of structural form and dominant species and likely vegetation boundaries were marked on a map or recorded by GPS. A minimum of one relevé was recorded for each vegetation unit, unless they were too small to map at the scale of the survey.

Within each relevé, the following were recorded:

- Site code;
- Location, with GPS coordinate and datum;
- Photograph of vegetation;
- Landform and soil description;
- Vegetation structural description and dominant species;
- Assessment of vegetation condition;
- A species list, including weeds; and

3.3.3 Targeted Flora Survey

A targeted flora survey was undertaken within remnant native vegetation in the Survey Area. The area was not systematically traversed at 10 m intervals due to dense swamp vegetation which required a more ad-hoc approach where impenetrable vegetation had to be avoided. Instead additional time was spent in these areas, looking into and under dense vegetation from the edges, while traversing gaps at a suitable intensity but in a non-linear manner.

Note: current DBCA terms and conditions for the collection of threatened flora prevent the disclosure of specific locality information of threatened flora populations to other persons without the written permission of the CEO.

3.3.4 Basic Fauna Survey

A basic fauna survey was undertaken in accordance with EPA's (2020) *Technical Guidance - Terrestrial vertebrate fauna surveys for environmental impact assessment*.

This included an assessment of vegetation and soil associations and microhabitats present, and broad habitat mapping. Opportunistic fauna observations were be made during the habitat assessment.

Three camera traps were set 25-28 October (Table 3.5, Figure 3.1) and bird surveys conducted throughout and on adjacent mudflats, over two consecutive mornings and afternoons. Targeted searching for signs of significant fauna was conducted throughout, and once Western Ringtail Possums signs were observed, a wider transect was searched to identify the species presence.

Table 3.5 Camera trap locations

Camera Name	Datum	Latitude	Longitude	Habitat
C1	GDA2020	-35.0243271	117.8619259	Densely vegetated drainage
C2	GDA2020	-35.0251351	117.8608117	Peppermint thicket
C3	GDA2020	-35.0265703	117.8599226	Peppermint thicket

3.4 Specimen Identification

Flora samples collected during the survey had information recorded that allows for identification and allocation to the correct sample site or collection location. Specimens were pressed in the field so that as many identifiable characteristics were preserved and to ensure that they dried correctly. Taxonomic work was completed with reference to appropriate keys and other works by personnel with adequate skills and training. Samples that could be identified, were conservation significant, potential novel species or range extensions

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were be submitted to the Western Australian Herbarium for identification. Nomenclature followed Florabase (WAHerb, 1998-).

3.5 Data analysis

3.5.1 Vegetation units

Vegetation units were delineated using a combination of sample site data, site observations and cluster analysis. Aerial photography interpretation and field notes taken during the survey were then used to develop vegetation mapping polygon boundaries over the Survey Area. These polygon boundaries were then digitised using GIS software.

Vegetation descriptions have been adapted from the (NVIS) Australian Vegetation Attribute Manual Version 7.0 (NVIS Technical Working Group 2017), a system of describing structural vegetation units (based on dominant taxa). This model follows nationally agreed guidelines to describe and represent vegetation types, so that comparable and consistent data is produced nation-wide.

3.6 Constraints and Limitations

The survey was evaluated against a range of standard limitations (Table 3.6) identified by EPA (2016) which are required to be addressed for every survey. Based on this evaluation, the assessment was subject to limitations or constraints that have affected the thoroughness of the assessment and the conclusions reached.

Table 3.6 Flora and Vegetation Survey Potential Limitations and Constraints

Potential Limitation	Impact on Assessment	Comment
Availability of contextual information at a regional and local scale	Not a constraint	Adequate regional and local contextual information was available.
Proportion of flora Recorded and/or collected, any identification issues	Not a constraint	Some taxa were incompletely identified, however this was not considered to be a constraint for a Reconnaissance level survey and those taxa were able to be excluded as listed flora taxa.
Was the appropriate area fully surveyed (extent and effort)	Not a constraint	The Survey Area was fully surveyed sufficient for a Reconnaissance level survey.
Survey timing, rainfall, season of survey	Not a constraint	The survey was conducted in spring 2023, which received 93% of the long-term average rainfall.
Disturbance that may have affected the results of the survey such as fire, flood or clearing	Not a constraint	There were no recent disturbances which affected the results of the Survey.
Access problems (i.e., ability to access Survey Area).	Minor constraint	The Survey Area was boggy and much of it was full of tall grass, within which footing was unsure. This prevented traversing through some of the historically cleared areas of the Survey Area. One vegetation unit on the foreshore was in deep mud and could not be accessed.
Competency/experience of the team carrying out the survey, including experience in the bioregion surveyed	Not a constraint	Lead Botanist Rachael Pratt has >5 years' experience in the Jarrah Forrest IBRA bioregion.

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Table 3.7 Fauna Survey Potential Limitations and Constraints

Potential Limitation	Impact on Assessment	Comment
Availability of data and information	Not a constraint	Adequate regional and local contextual information was available.
Competency/experience of the survey team, including experience in the bioregion surveyed	Not a constraint	Lead Zoologist Jeff Turpin is experienced in systematic fauna surveys and fauna identification and has extensive experience of the fauna of the Jarrah Forrest IBRA region.
Scope of the survey, e.g. where faunal groups were excluded from the survey	Not a constraint	No vertebrate fauna groups were excluded, however this was a Basic fauna survey only.
Timing, weather and season	Not a constraint	The survey was undertaken during spring, following adequate rainfall, during the primary season for reptiles, bush birds and mammals. Although out of season, sufficient water was present at the site that frogs were active. The survey did not occur at peak times for migratory birds, however the Survey Area did not contain significant wetlands and was adjacent to mudflats which would see more use by migratory birds.
Disturbance that may have affected results, e.g. fire, flood	Not a constraint	There were no recent disturbances which affected the results of the Survey.
The proportion of fauna identified, recorded or collected	Not a constraint	The proportion of fauna identified and recorded was adequate for a Basic fauna survey.
Adequacy of the survey intensity and proportion of survey achieved, e.g. the extent to which the area was surveyed	Not a constraint	All habitats within the Survey Area were accessible.
Access problems	Minor constraint	The Survey Area was boggy and much of it was full of tall grass, within which footing was unsure. This prevented traversing through some of the historically cleared areas of the Survey Area.
Problems with data and analysis, including sampling biases	Not a constraint	No sampling biases or other problems with data and analyses were encountered.

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Legend

- Survey Area
- Cadastral boundary
- Releve
- Camera trap
- Traverse
- Highway
- Major road
- Minor road
- Track

JBS&G

Job No: 65310

Client: ROWE Group

Version: A	Date: 16/08/2024
Drawn By: ianandagoda	Checked By: RP

Scale 1:2,800 at A4

0 50 100
metres

Coord. Sys. GDA2020 MGA Zone 50

Woolstores Place, Albany, WA

SURVEY EFFORT

FIGURE 3.1

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4. Results

4.1 Flora

4.1.1 Flora Assemblage

Eighty vascular flora taxa from 69 genera and 37 families were recorded during the survey, including 53 introduced taxa. No species accumulation curve has been prepared for this assessment because of the highly degraded nature of the site and its unusual diversity of introduced flora taxa.

4.1.2 Introduced Flora

Fifty-three introduced flora taxa were recorded during the survey, including two weeds listed as Declared Pests under the BAM Act:

- *Acacia longifolia* subsp. *longifolia*
- *Asparagus asparagoides*
- *Avena barbata*
- *Briza maxima*
- *Briza minor*
- *Callistemon sp.*
- *Cenchrus clandestinus*
- *Centella asiatica*
- *Cirsium vulgare*
- *Coprosma repens*
- *Cortaderia selloana*
- *Cotula coronopifolia*
- *Crassula glomerata*
- *Cupressaceae* sp.
- *Cynodon dactylon*
- *Dipogon lignosus*
- *Erigeron bonariensis*
- *Eucalyptus globulus*
- *Eucalyptus petiolaris*
- *Euphorbia paralias*
- *Fumaria muralis* subsp. *muralis*
- *Gaudium laevigatum*
- *Geranium molle*
- *Hypochaeris glabra*
- *Juncus oxycarpus*
- *Lagunaria patersonia*
- *Lagurus ovatus*
- *Lemna minor*
- *Lolium* sp.
- *Lophostemon confertus*
- *Lotus subbiflorus*
- *Lysimachia arvensis*
- *Metrosideros* sp.
- *Oxalis pes-caprae*
- *Pelargonium capitatum*
- *Physalis peruviana*
- *Phytolacca octandra*
- *Plantago sp.*
- *Polypogon monspeliensis*
- *Psoralea pinnata*
- *Rubus ulmifolius*
- *Rumex acetosella*
- *Salix babylonica*
- *Solanum laciniatum*
- *Solanum nigrum*
- *Sonchus asper*
- *Stachys arvensis*
- *Stenotaphrum secundatum*
- *Tamarix aphylla* Declared Pest - s22(2)
- *Tropaeolum majus*

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- *Watsonia meriana*
- *Yucca aloifolia*
- *Zantedeschia aethiopica* Declared Pest - s22(2)

4.1.3 Significant Flora

4.1.3.1 Listed Flora

No flora listed as Threatened or Priority at a State or Commonwealth level were identified during the Survey.

4.1.3.2 Other Significant Flora

Tecticornia ?indica subsp. *bidens, Juncus ?krausii* and *Threlkeldia diffusa* were identified during the Survey. These species are associated with the TEC *Subtropical and Temperate Coastal Saltmarsh* listed as Vulnerable under the EPBC Act.

4.1.4 Unidentified Flora

Several flora taxa were unable to be completely identified. This was usually due to an absence of reproductive material at the time of the survey. Some weeds were not collected, e.g. *Plantago* sp. because identifying the taxon to species level would not materially benefit the outcomes of the survey. One taxon, Cupressaceae sp. was an introduced conifer which was too tall to collect a specimen from.

4.2 Vegetation

4.2.1 Vegetation Units

Six vegetation units were identified in the Survey Area. The majority of these were dominated by weed taxa and poorly defined. Only three were considered to be of adequate condition to justify relevé assessment and of these, the *Juncus pallidus* closed sedgeland was inaccessible due to thick mud.

Table 4.1 Vegetation Units

Vegetation Unit	Area (ha)	Proportion of Survey Area	Photo
Juncus pallidus closed sedgeland over sparse mixed weeds and *Threlkeldia diffusa*	0.22	1.30%	

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Vegetation Unit	Area (ha)	Proportion of Survey Area	Photo
Melaleuca rhaphiophylla closed woodland over patches of *Taxandria juniperina*, over sparse forbland of *Isolepis prolifera, Microtis media, *Centella asiatica, *Zantedeschia aethiopica* and **Cotula coronopifolia* (Relevé 3)	0.26	1.53%	
Parkland cleared woodland of *Melaleuca rhaphiophylla* and *Agonis flexuosa* interspersed with **Salix babylonica* over *Pteridium esculentum* and mixed weed species	0.73	4.33%	
Tall shrubland of **Acacia longifolia, *Gaudium laevigatum* and ?**Syzygium smithii* with patches of emergent *Agonis flexuosa* over **Cenchrus clandestinus,* mixed weeds and isolated *Anigozanthos viridis*	0.22	1.32%	

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Vegetation Unit	Area (ha)	Proportion of Survey Area	Photo
Woodland of *Eucalyptus cornuta* and **Eucalyptus globulus* over *Agonis flexuosa*, over *Pteridium esculentum, *Stenotaphrum secundatum, *Cenchrus clandestinus* and **Pelargonium capitatum* (Relevé 1)	0.28	1.66 ha	
Parkland cleared	6.76 ha	44.33%	
Unvegetated	8.30	49.53%	
Total	**16.77**		

One additional vegetation unit was described adjacent to the Survey Area:

- Low, closed samphire shrubland of *Tecticornia ?indica* subsp. *bidens*, with sparse **Juncus ?kraussii* subsp. *australiensis* and *Threlkeldia diffusa*. (Relevé 2)

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Plate 4 Fringing Temperate and Subtropical Saltmarsh outside the Survey Area

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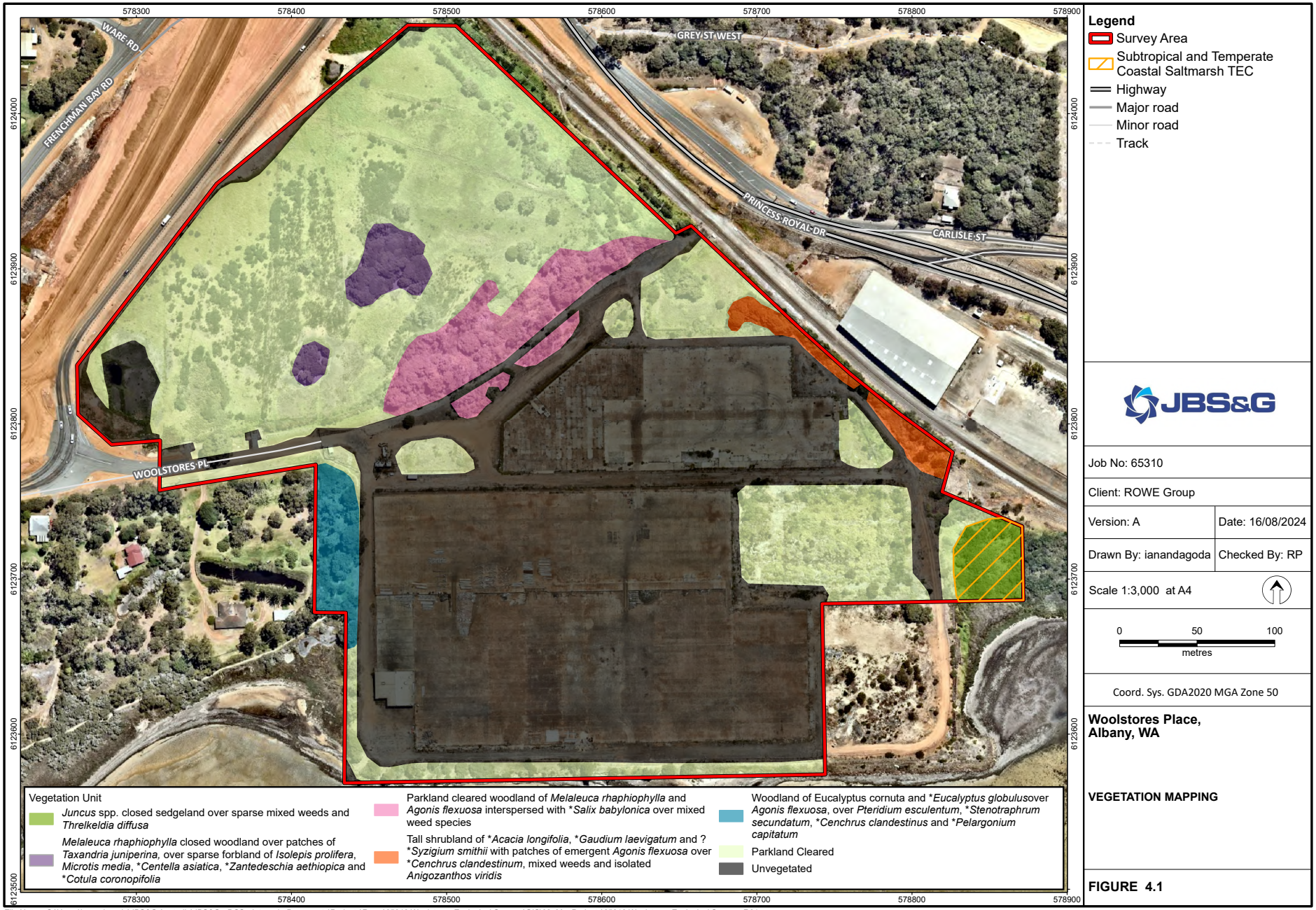

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4.2.2 Vegetation Condition

The majority of the Survey Area was in Completely Degraded condition due to historic clearing (Table 4.2). These areas were covered by weeds, concrete and hardstand.

Table 4.2 Vegetation condition in the Survey Area

Condition	Area (ha)	Proportion of Survey Area
Completely Degraded	16.29	97.02%
Good	0.03	0.16%
Very Good	0.47	2.82%
Grand Total	**16.79**	

4.2.3 Significant Vegetation

4.2.3.1 Conservation Dependent Vegetation

Vegetation in the Juncus closed sedgeland was consistent with the key diagnostic criteria for the TEC *Subtropical and Temperate Coastal Saltmarsh* (Table 4.3). This patch is contiguous with saltmarsh vegetation outside the Survey Area, amounting to approximately 1 ha (greater than the minimum patch size of 0.4 ha). The patch contained <50% weeds, meeting the minimum condition thresholds.

Table 4.3 Key Diagnostic Criteria for the Subtropical and Temperate Coastal Saltmarsh Ecological Community

Diagnostic Criteria	Site features	Met/Not Net
Occurs south of 23° 37' S latitude - from the central Mackay coast on the east coast of Australia, southerly around to Shark Bay on the west coast of Australia (26° latitude) and including the Tasmanian coast and islands within the above range.	The site occurs at 35° south.	Met
Occurs on the coastal margin, along estuaries and coastal embayments and on low wave energy coasts.	The site occurs on the shore of the Princess Royal Harbour, a coastal embayment in King George Sound.	Met
Occurs on places with at least some tidal connection, including rarely-inundated supratidal areas, intermittently opened or closed lagoons, and groundwater tidal influences, but not areas receiving only aerosol spray.	The site had visual indicators of tide activity (low and high tide lines).	Met
Occurs on sandy or muddy substrate and may include coastal clay pans (and the like).	The site had deep muds.	Met
Consists of dense to patchy areas of characteristic coastal saltmarsh plant species (i.e. salt tolerant herbs, succulent shrubs or grasses, which may also include bare sediment as part of the mosaic) and.	The site was dominated by *Juncus* spp. and *Threlkeldia diffusa* and *Tecticornia ?indica* was present adjacent.	Met
Proportional cover by tree canopy such as mangroves, Melaleucas or Casuarinas is not greater than 50%, nor is proportional ground cover by seagrass greater than 50%.	No tree cover was present.	Met

4.2.3.2 Groundwater Dependent Vegetation

Much of the Survey Area would have had historic dependence on groundwater due to the high water table in the Survey Area and its location in the riparian zone for Princess Royal Harbor, however, few native vegetation remnants remain on the site. Saltmarsh in the Survey Area and *Melaleuca* woodland should both be treated as having groundwater dependence.

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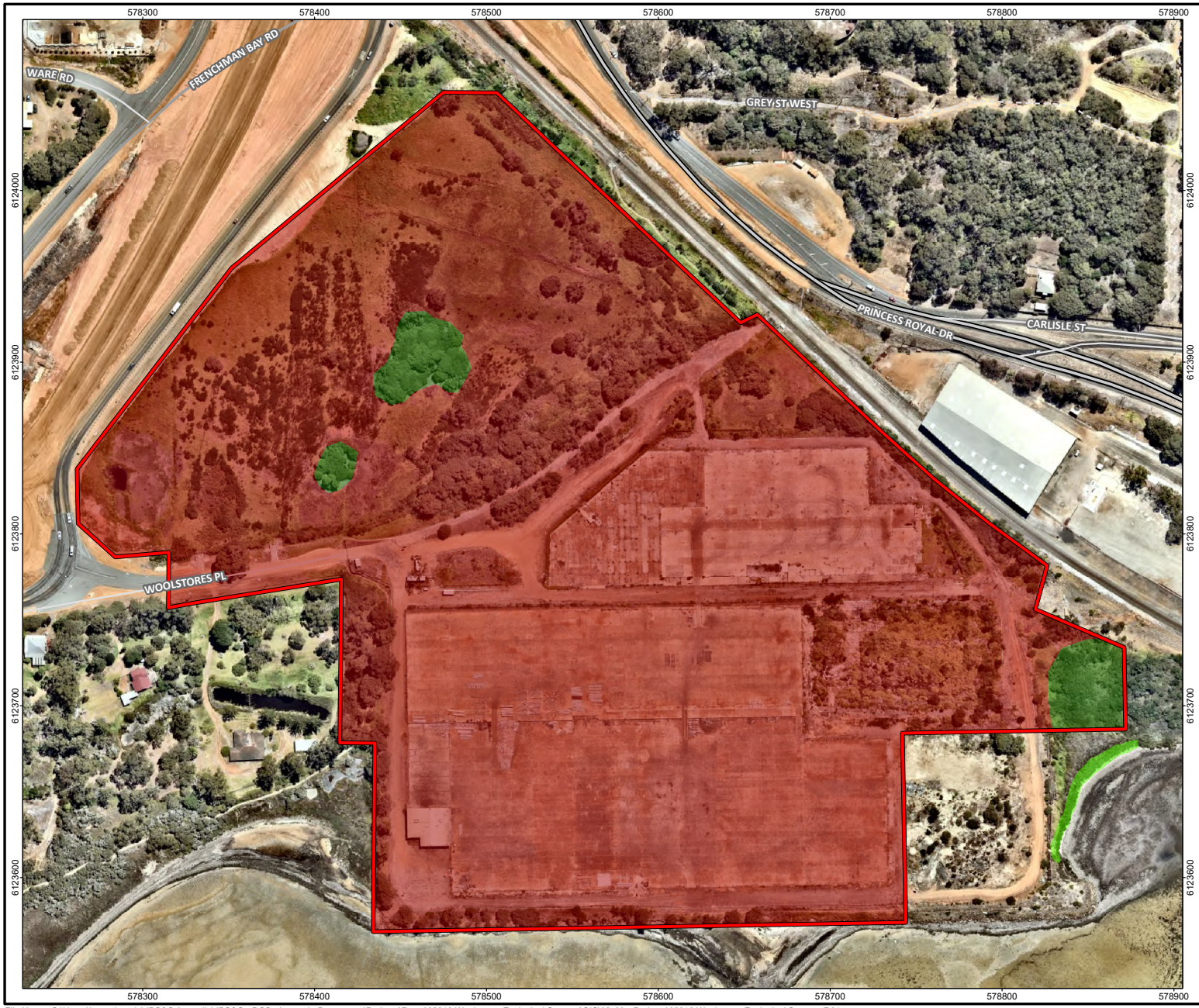

Legend

- Survey Area
- Vegetation condition
  - Very Good
  - Good
  - Completely Degraded
- Highway
- Major road
- Minor road
- Track

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Scale 1:3,000 at A4

0 50 100
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VEGETATION CONDITION

FIGURE 4.2

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4.3 Fauna

4.3.1 Fauna Assemblage

Seventy three fauna taxa were recorded during the Survey including 57 from within the Survey Area and additional bird sightings adjacent (Appendix F). The following taxa were observed during the survey (Table 4.4, Plate 5, Figure 4.3).

Table 4.4 Fauna taxa observed during the survey

Taxon	Status	Observation
Amphibians		
Slender Tree Frog (*Litoria adelaidensis)*		Heard
Motorbike Frog (*Litoria moorei*)		Heard
Rattling Froglet (*Crinia glauerti*)		Heard
Reptiles		
King's Skink (*Egernia kingii*)		Camera trap
Mammals		
Quenda, Southern Brown Bandicoot (*Isoodon obesulus*)	P4	Camera trap, diggings, seen
Western Ringtail Possum (*Pseudocheirus occidentalis*)	CE	Dreys, scat
Western Grey Kangaroo (*Macropus fuliginosus*)		Seen
Dog (*Canis lupus*)	Introduced	Seen
Cat (*Felis catus*)	Introduced	Camera trap
Rabbit (*Oryctolagus cuniculus*)	Introduced	Camera trap
Black Rat (*Rattus rattus*)	Introduced	Camera trap
Birds		
Acanthiza chrysorrhoa (Yellow-rumped Thornbill)		Seen
Actitis hypoleucos (Common Sandpiper)	MI	Seen adjacent
Anas castanea (Chestnut Teal)		Seen
Anas superciliosa (Pacific Black Duck)		Seen
Anhinga melanogaster (Darter)		Seen adjacent
Anthochaera carunculata (Red Wattlebird)		Seen
Ardea alba (Eastern Great Egret)	MI	Seen adjacent
Barnardius zonarius (Australian Ringneck)		Seen
Cacomantis flabelliformis (Fan-Tailed Cuckoo)		Seen
Calidris ruficollis (Red-necked Stint)	MI	Seen
Calyptorhynchus banksii (Red-tailed Black-Cockatoo)	VU	Heard adjacent
Chalcites lucidus (Shining Bronze Cuckoo)		Seen
Charadrius ruficapillus (Red-capped Plover)		Seen
Chenonetta jubata (Australian Wood Duck)		Seen
Circus approximans (Swamp Harrier)		Seen
Colluricincla harmonica (Grey Shrike-thrush)		Seen
Columba livia (Feral Pigeon)		Seen
Coracina novaehollandiae (Black-faced Cuckoo-shrike)		Seen

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Taxon	Status	Observation
Corvus coronoides (Australian Raven)		Seen
Cracticus tibicen (Australian Magpie)		Seen
Cracticus torquatus (Grey Butcherbird)		Seen
Egretta novaehollandiae (White-faced Heron)		Seen
Eolophus roseicapillus (Galah)		Seen
Gavicalis virescens (Singing Honeyeater)		Seen
Glossopsitta porphyrocephala (Purple-crowned Lorikeet)		Seen
Grallina cyanoleuca (Magpie-lark)		Seen
Haematopus longirostris (Pied Oystercatcher)		Seen
Haliastur sphenurus (Whistling Kite)		Seen
Hirundo neoxena (Welcome Swallow)		Seen
Hydroprogne caspia (Caspian Tern)	MI	Seen adjacent
Larus novaehollandiae (Silver Gull)		Seen
Larus pacificus (Pacific Gull)	MI	Seen adjacent
Lichmera indistincta (Brown Honeyeater)		Seen
Malurus elegans (Red-winged Fairywren)		Seen
Malurus splendens (Splendid Fairy-wren)		Seen
Pachycephala pectoralis (Golden Whistler)		Seen
Pandion haliaetus (Eastern Osprey)	MI	Seen
Pardalotus punctatus (Spotted Pardalote)		Seen
Pelecanus conspicillatus (Australian Pelican)		Seen adjacent
Petrochelidon ariel (Fairy Martin)		Seen
Phalacrocorax carbo (Great Cormorant)		Seen adjacent
Phalacrocorax melanoleucos (Little Pied Cormorant)		Seen adjacent
Phalacrocorax sulcirostris (Little Black Cormorant)		Seen adjacent
Phalacrocorax varius (Pied Cormorant)		Seen adjacent
Phaps chalcoptera (Common Bronzewing)		Seen
Phylidonyris novaehollandiae (New Holland Honeyeater)		Seen
Platalea flavipes (Yellow-billed Spoonbill)		Seen adjacent
Platycercus icterotis (Western Rosella)		Seen
Pluvialis squatarola (Grey Plover)	MI	Seen adjacent
Poodytes gramineus (Little Grassbird)		Seen adjacent
Porphyrio porphyrio (Purple Swamphen)		Seen
Purpureicephalus spurius (Red-capped Parrot)		Seen
Rhipidura albiscapa (Grey Fantail)		Seen
Rhipidura leucophrys (Willie Wagtail)		Seen
Sericornis maculatus (Spotted Scrubwren)		Seen
Smicrornis brevirostris (Weebill)		Seen
Stagonopleura oculata (Red-eared Firetail)		Seen
Sternula nereis (Fairy Tern)	VU/MI	Seen adjacent

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Taxon	Status	Observation
Stipiturus malachurus (Southern Emu-wren)		Seen
Thalasseus bergii (Crested Tern)	MI	Seen adjacent
Threskiornis moluuca (Australian White Ibis)		Seen
Zosterops lateralis (Silvereye)	MI	Seen

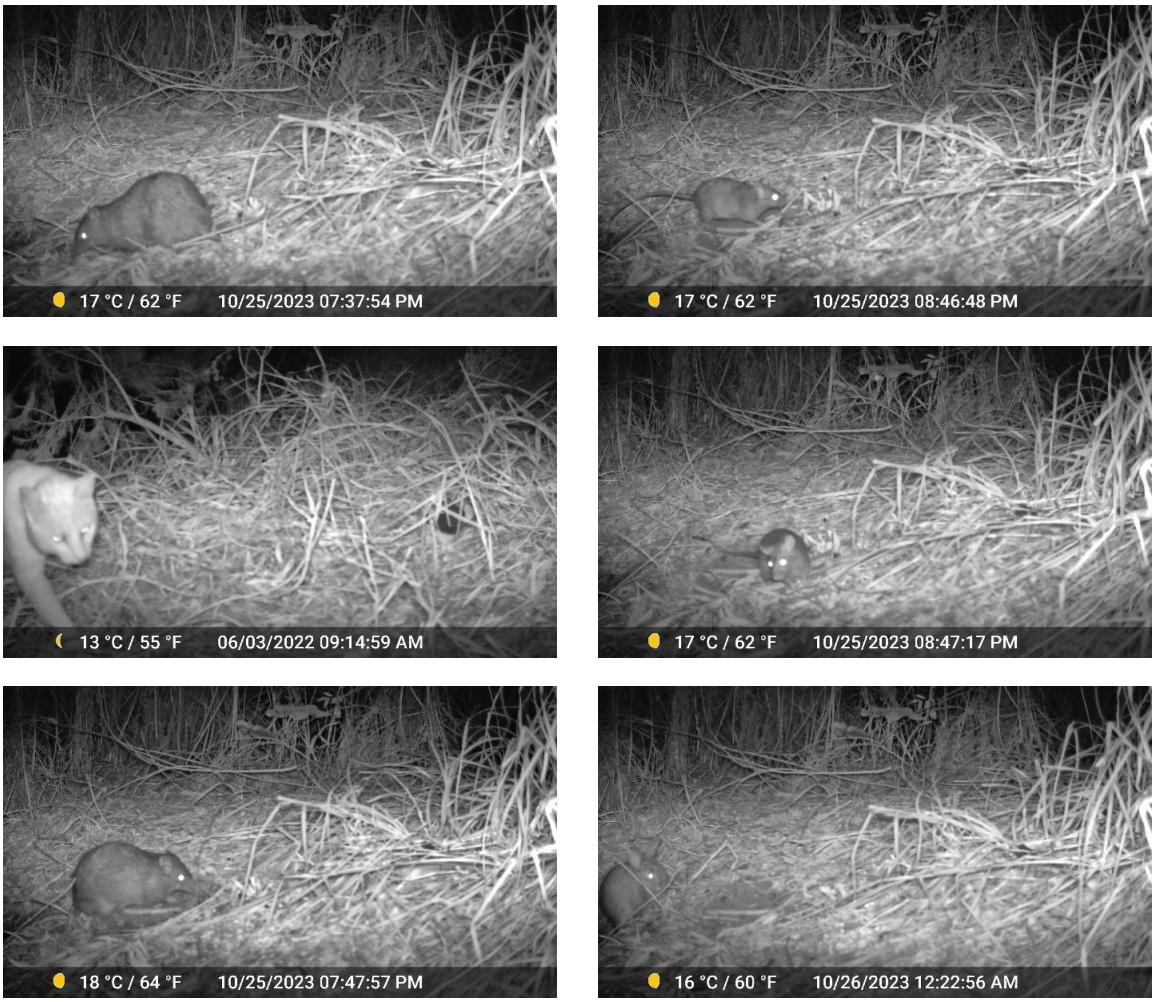

Plate 5 Camera trap images (note, one camera had the incorrect date and time set)

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Legend

- Survey Area
- Significant fauna
  - T
  - P4
- Highway
- Major road
- Minor road
- Track

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Job No: 65310

Client: ROWE Group

Version: A	Date: 16/08/2024
Drawn By: ianandagoda	Checked By: RP

Scale 1:3,000 at A4

0 50 100
metres

Coord. Sys. GDA2020 MGA Zone 50

Woolstores Place, Albany, WA

SIGNIFICANT FAUNA

FIGURE 4.3

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4.3.2 Fauna Habitat

Six fauna habitats were identified within the Survey Area (Table 4.5, Table 4.6, Figure 4.4). Most of these were highly modified but still retained some value to fauna as evidenced by fauna observed during the survey. Approximately 48.65% of the Survey Area was occupied by tracks, hardstand or concrete and provided little to no value for fauna.

Table 4.5 Fauna habitats in the Survey Area

Habitat type	Area (ha)	Proportion of Survey Area
Damplands 1	0.62	3.68%
Damplands 2	4.62	27.55%
Disturbed	2.22	13.27%
Drainage Line	0.78	4.67%
Freshwater and Brackish Wetlands	0.36	2.13%
Mudflats and Shoreline	0.01	0.05%
Unvegetated	8.16	48.65%
Total	**16.77**	

Table 4.6 Fauna habitat descriptions

Landform Vegetation	Inside survey area	Comments	Photo
Damplands 1 Melaleuca preissiana and Peppermint Woodland	Yes	Habitat for Western Ringtail Possum and Quenda	
Damplands 2 Mixed native and introduced species	Yes	Quenda occur	

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Landform Vegetation	Inside survey area	Comments	Photo
Disturbed Pasture, introduced weeds and native species	Yes	Quenda occur	
Drainage line Yate and Peppermint thickets over sedges and mixed shrubs	Yes	Habitat for Western Ringtail Possum and Quenda	
Freshwater and Brackish Wetlands Reeds / Sedges and fringing riparian	Yes	Waterbirds and frogs, Chestnut Teal breeding	

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Landform Vegetation	Inside survey area	Comments	Photo
Mudflats and shoreline None	Minimal	Wader habitat	

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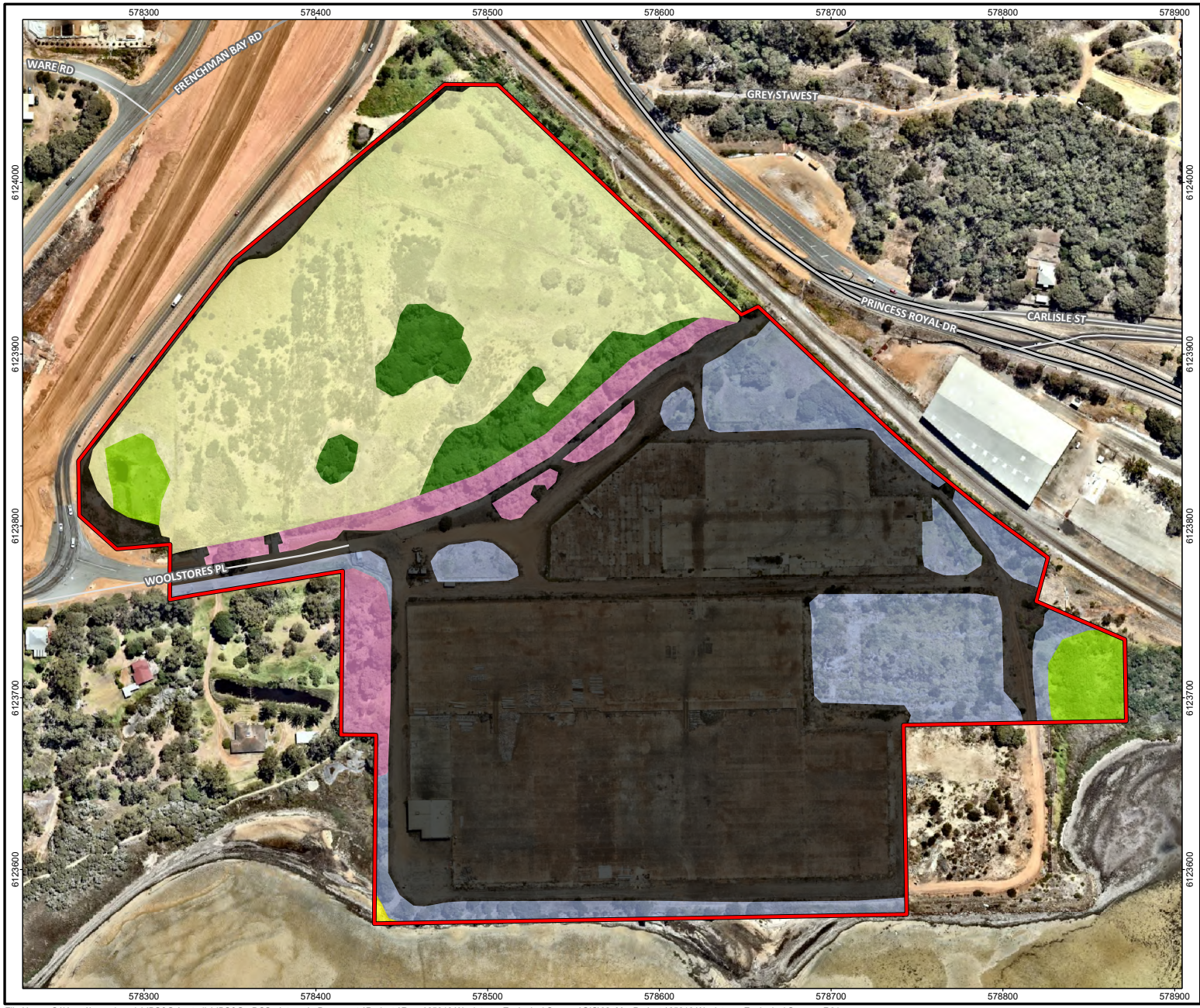

Legend

- Survey Area

Fauna habitat

- Damplands 1
- Damplands 2
- Disturbed
- Drainage Line
- Freshwater and Brackish Wetlands
- Mudflats and Shoreline
- Unvegetated

- Highway
- Major road
- Minor road
- Track

JBS&G

Job No: 65310

Client: ROWE Group

Version: A	Date: 16/08/2024
Drawn By: ianandagoda	Checked By: RP

Scale 1:3,000 at A4

0 50 100
metres

Coord. Sys. GDA2020 MGA Zone 50

Woolstores Place, Albany, WA

FAUNA HABITAT

FIGURE 4.4

File Name: C:\Users\ianandagoda\JBS&G Australia\JBS&G - DCS - Internal - Documents\Projects\Rowe\65310 Woolstores Ecological Surveys\GIS\02_MapProjects\65310 Woolstores Ecological Surveys R01.aprx
Image Reference: www.nearmap.com© - Imagery Date: February 10. 2024

5. Discussion

5.1 Flora

Native species diversity in the Survey Area was extremely poor (16 taxa) due to historic clearing and the presence of invasive weed species at high densities.

No flora species listed at a State or Commonwealth level were present in the Survey Area. Although the high densities of weeds would have made listed taxa difficult to detect, it is unlikely that any are present since the site has been historically cleared and likely grazed.

"Significant" flora in the Survey Area were restricted to saltmarsh taxa and *Melaleuca* species which are groundwater dependent.

5.2 Vegetation

The Survey Area contained 0.48 ha of intact native vegetation, with the remaining vegetation units being degraded to the extent that they no longer represent a community of indigenous species native to the area. Instead these areas were parkland cleared, with no more than three native flora taxa present.

Vegetation at the eastern end of the Survey Area was consistent with the TEC *Subtropical and Temperate Coastal Saltmarsh*, listed as Vulnerable under the EPBC Act and Priority 3 by DBCA. Dense cover of Juncus has resulted in low native species richness in the patch, but also low levels of weed invasion.

Saltmarsh in the Survey Area is at risk from anthropogenic changes in sea level, with steep embankments preventing saltmarsh from retreating landward as sea levels rise. Other risks to the patch include weed invasion, acid sulfate soils, stormwater drainage, reinforcement of embankments for development and pedestrian traffic.

5.3 Fauna

Two fauna taxa listed at a State or Commonwealth level were identified within the Survey Area, Western Ringtail Possum and Quenda. One additional listed taxon, the Forest Red-tailed Black Cockatoo was heard outside the Survey Area and ten bird species listed as Migratory and/or under an International Agreement were recorded in or adjacent to the Survey Area. One of these, the Fairy Tern is also listed as Vulnerable under the EPBC Act.

Western Ringtail Possum (*Pseudocheirus occidentalis*)

The Western Ringtail Possum is a small, arboreal mammal whose distribution is restricted to the South-west of Western Australia. It inhabits coastal and near coastal Peppermint-Tuart, Jarrah-Marri, Sheoak and eucalypt woodland and mallee woodland (preferably closed-canopy) (DPaW, 2017).

Numerous Peppermint trees occurred within the Survey Area and dreys were found in two locations, with additional dreys found south-west along the coastline. Numerous scat were found below shrubs growing along the top of the embankment on the southern side of the reclaimed land, as well as in other areas of the Survey Area.

Quenda/Southern Brown Bandicoot (*Isoodon obesulus*)

The Quenda/Southern Brown Bandicoot is a small, ground-dwelling mammal which ranges from New South Wales to Western Australia, predominantly in coastal and near-coastal areas. It inhabits forest, woodland, shrub and heath communities, typically with dense, healthy vegetation in the lower stratum (van Dyck, et al., 2013). Most habitats within the Survey Area provide suitable habitat for Quenda.

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Most Quenda observations were made in and around thickly-grassed, elevated areas of the site.

Forest Red-tailed Black Cockatoo (*Calyptorhychus banksii naso*)

The Forest Red-tailed Black Cockatoo is a large bird endemic to the South-west of Western Australia. It relies upon Marri, Jarrah, Wandoo, Tuart and Karri woodlands and forests, where they feed primarily on Marri and Jarrah (Johnstone & Kirkby, 2011).

EPBC Act referral guidelines for black cockatoos (DAWE, 2022) describe referral triggers including the loss of greater than 1 ha of high-quality foraging habitat or the loss of one or more suitable nesting trees. To qualify as high-quality foraging habitat for the Forest Red-tailed Black Cockatoo, a site must contain Jarrah or Marri woodland/forest, be on the edge of Karri forest or contain Wandoo or Blackbutt (DAWE, 2022). None of this habitat was present within the Survey Area.

Fairy Tern

The Fairy Tern is a is a small tern occurring along Australia's south coast. It inhabits coastal waters, bays, inlets, saline or brackish lakes, saltfields, sewage ponds near coast (Pizzey & Knight, 2012). It was not seen inside the Survey Area but was seen foraging in the Princess Royal Harbour. Within the Survey Area, saline or brackish lakes may provide habitat for Fairy Terns.

Migratory Birds

Although numerous birds listed as Migratory under the EPBC Act and/or subject to International Agreements were identified within or adjacent to the Survey Area, most of the Survey Area does not provide suitable habitat for these species, all of which were observed in the Princess Royal Harbor or immediately adjacent. Within the Survey Area, saline or brackish lakes may provide occasional habitat for these species and they may utilise the rocky embankment on the southern shoreline.

5.4 Fauna Habitat

The most significant fauna habitat identified by the Survey was Western Ringtail Possum habitat (Drainage Line and Damplands 1). This occupied 8.35 % (1.4 ha) of the Survey Area. Western Ringtail Possums are listed as Critically Endangered under the EPBC Act and the BC Act. Twelve dreys were present in the Survey Area and numerous scat, suggesting that the Survey Area is well used.

Quenda, King Skink and three frog species were also resident and are unlikely to be easy to relocate during clearing as they hide under vegetation.

The mudflats adjacent to the Survey Area appear important for waders with close to 100 Red-necked Stints, a migratory species subject to International Agreements (EPBC Act, Bonn, CAMBA, JAMBA, ROKAMBA), recorded adjacent to the Survey Area. Greater Sand Plover, Red Knot, Ruddy Turnstone, Pacific Golden Plover, Bar-tailed Godwit and Great Knot were all recorded nearby within 5 km (Little Grove-Rushy Point) during September and October 2023 (Cornell University, 2023).

5.5 Survey Adequacy

Given the land-use history and predominantly cleared nature of the Survey Area, a Reconnaissance flora and vegetation survey in combination with Targeted flora survey and Basic fauna survey is considered adequate for this site. Although additional effort might find additional flora taxa, the vast majority of these would be introduced taxa.

The Survey Area did not contain significant microhabitats typical of Short Range Endemic fauna. Main's Assassin Spider was the only listed invertebrate species which might occur in the Survey Area as this inhabits sedges and low shrubs in dense coastal or near-coastal groves of Peppermint, consistent with the Damplands 1 and Drainage Line fauna habitats. Other dense vegetation in the Survey Area may also provide habitat. Main's

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Assassin Spider was collected approximately 3.5 km from the Survey Area in 1983. There were no other nearby records of this taxon.

The very small lake in the Survey Area has potential to host threatened freshwater fish species, which have been recorded within 5 km of the Survey Area.

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6. Conclusion

The key results and outcomes of the flora and vegetation survey were:

- Twenty-seven native flora species were recorded within the Survey Area;
- Fifty-three introduced flora species were recorded within the Survey Area, two of which were Declared Pests;
- No listed (conservation significant) flora taxa were identified by the survey;
- Most of the undeveloped portion of the Survey Area was a wetland (6.38 ha or 38.04% of the Survey Area);
- One EPBC Act listed threatened ecological community was identified by the survey, *Subtropical and Temperate Coastal Saltmarsh,* occupying 0.22 ha (1.3 % of the Survey Area). Access to this community was limited due to deep mud;
- One predominantly native vegetation type and three degraded vegetation units containing few native species were mapped across the Survey Area, ranging in condition from Very Good to Completely Degraded, with 16.29 ha (97.02 % of the Survey Area) being in Completely Degraded condition; and
- Vegetation units within the Survey Area are likely to be groundwater dependent.

The key results and outcomes of the fauna survey were:

- Sixty-nine native or migratory fauna were recorded within and adjacent to the Survey Area, including three frogs, one lizard, three mammals and 62 birds;
- Four introduced fauna taxa were recorded within the Survey Area;
- Thirteen listed fauna taxa were observed during the survey including ten migratory, one Critically Endangered, two Vulnerable and one Priority 4 fauna taxa.
- The Survey Area contained approximately 1.40 ha (8.35 % of the Survey Area) of Western Ringtail Possum (Critically Endangered) habitat and was utilised by Western Ringtail Possum, with both dreys and scat found;
- The Survey Area contained approximately 8.24 ha (49.14 % of the Survey Area) of Quenda habitat and was utilised by Quenda, with camera trap sightings;
- The adjacent mudflats which were outside the Survey Area are likely to be a regionally significant habitat for waterbirds, including Fairy Terns (listed as Vulnerable and Migratory under the EPBC Act);
- Potential habitat for listed fish species was present (Freshwater and Brackish wetlands), but targeted survey for these was outside the scope of this survey;
- Potential habitat for the Mains Assassin Spider was present (Damplands 1, Damplands 2, Drainage Line and riparian zones of Freshwater and Brackish Wetlands), but targeted survey for these was outside the scope of this survey; and
- No habitat for threatened black cockatoo species was identified, although the Forest Red-tailed Black Cockatoo (listed as Vulnerable under the EPBC Act) was heard nearby.

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7. Limitations

Scope of services

This report ("the report") has been prepared by JBS&G in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and JBS&G. In some circumstances, a range of factors such as time, budget, access and/or site disturbance constraints may have limited the scope of services. This report is strictly limited to the matters stated in it and is not to be read as extending, by implication, to any other matter in connection with the matters addressed in it.

Reliance on data

In preparing the report, JBS&G has relied upon data and other information provided by the Client and other individuals and organisations, most of which are referred to in the report ("the data"). Except as otherwise expressly stated in the report, JBS&G has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("conclusions") are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. JBS&G has also not attempted to determine whether any material matter has been omitted from the data. JBS&G will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to JBS&G. The making of any assumption does not imply that JBS&G has made any enquiry to verify the correctness of that assumption.

The report is based on conditions encountered and information received at the time of preparation of this report or the time that site investigations were carried out. JBS&G disclaims responsibility for any changes that may have occurred after this time. This report and any legal issues arising from it are governed by and construed in accordance with the law as at the date of this report.

Environmental conclusions

Within the limitations imposed by the scope of services, the preparation of this report has been undertaken and performed in a professional manner, in accordance with generally accepted environmental consulting practices. No other warranty, whether express or implied, is made, including to any third parties, and no liability will be accepted for use or interpretation of this report by any third party.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

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Appendix A Conservation Significant Flora and Ecological Community Definitions

Biodiversity Conservation Act 2016 (Western Australia)

Threatened, Extinct and Specially Protected Fauna and Flora

Under the Western Australian Biodiversity Conservation Act 2016, Threatened, Extinct and Specially Protected fauna or flora are species which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such.

A.1 Western Australian Threatened, Extinct and Specially Protected fauna and flora categories

Code	Conservation Category
Threatened Species (T)	
Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act). Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna. Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threatened Flora. The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.	
CR	**Critically Endangered Species** Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.
EN	**Endangered Species** Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for endangered flora.
VU	**Vulnerable Species** Threatened species considered to be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora.
Extinct species (EX) Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.	
EX	**Extinct Species** Species where "there is no reasonable doubt that the last member of the species has died", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act). Published as presumed extinct under schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for extinct flora.
EW	**Extinct in the Wild Species** Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).

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Code	Conservation Category
	Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.
Specially Protected Species	
Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection. Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.	
MI	**Migratory Species** Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act). Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species. Published as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018.*
CD	**Species of special conservation interest (conservation dependent fauna)** Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act). Published as conservation dependent fauna under schedule 6 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018.*
OS	**Other specially protected species** Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act). Published as other specially protected fauna under schedule 7 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.
Priority species (P)	
Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations	
P1	**Priority 1: Poorly-known species** Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
P2	**Priority 2: Poorly-known species** Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
P3	**Priority 3: Poorly-known species**

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Code	Conservation Category
	Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
P4	**Priority 4: Rare, Near Threatened and other species in need of monitoring** Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Threatened and Priority Ecological Communities

Division 2 of the *Biodiversity Conservation Act 2016* (BC Act) provides for the statutory listing of threatened ecological communities (TECs) by the Minister.

A.2 Western Australian listed Threatened Ecological Community categories

Code	Conservation Category
PD	**Presumed Totally Destroyed (PD)** An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future. An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies (a or b) Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats or All occurrences recorded within the last 50 years have since been destroyed.
CR	**Critically Endangered Communities** An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated. An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (a, b or c): a. The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii): i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years); ii) modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated. b. Current distribution is limited, and one or more of the following apply (i, ii or iii): i. geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years); ii. there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes; iii. there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes. c. The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).
EN	**Endangered Communities** An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.

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Code	Conservation Category
	An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (a, b, or c): a. The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply (i or ii): i. the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years); ii. modification throughout its range is continuing such that in the short-term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated. b. Current distribution is limited, and one or more of the following apply (i, ii or iii): i. geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years); ii. there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes; iii. there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes. c. The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).
VU	**Vulnerable Communities** An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range. An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium (within approximately 50 years) to long-term future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (a, b or c): a. The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated. b. The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations. c. The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long-term future because of existing or impending threatening processes.

Priority Ecological Communities

Priority is not a listing category under the BC Act. The Priority Ecological Communities list is maintained by Department of Biodiversity, Conservation and Attractions and is published on the department's website.

All fauna and flora that may be present in an ecological community are protected in WA following the provisions in Part 10 of the BC Act. The protection applies even when these species occur in an ecological community that is not listed as threatened, and regardless of land tenure (State managed land (Crown land), private land, or Commonwealth land).

Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community List under priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community. Ecological communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

A.3 Western Australian listed Priority Ecological Community categories

Code	Conservation Category
P1	**Priority One: Poorly-known ecological communities**

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Code	Conservation Category
	Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤ 5 occurrences or a total area of ≤ 100 ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
P2	**Priority Two: Poorly-known ecological communities** Communities that are known from few occurrences with a restricted distribution (generally ≤ 10 occurrences or a total area of ≤ 200 ha). At least some occurrences are not believed to be under immediate threat (within approximately 10 years) of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
P3	**Priority Three: Poorly known ecological communities** Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them. This category includes three sub-categories: a. Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation. b. Communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately 10 years). c. Communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change etc.
P4	**Priority Four: Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list.** These communities require regular monitoring. a. Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands. b. Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for a higher threat category. c. Ecological communities that have been removed from the list of threatened communities during the past five years.
P5	**Priority Five: Conservation Dependent ecological communities** Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)

Threatened Species

Threatened fauna and flora may be listed under Section 178 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in any one of the following categories.

A.4 Commonwealth listed Threatened Species categories

Code	Conservation Category
EX	**Extinct Species** A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
EW	**Extinct in the Wild Species** A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time: a. it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or

Code	Conservation Category
	b. it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, d
CR	**Critically Endangered Species** A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
EN	**Endangered Species** A native species is eligible to be included in the endangered category at a particular time if, at that time: a. it is not critically endangered; and b. it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
VU	**Vulnerable Species** A native species is eligible to be included in the vulnerable category at a particular time if, at that time: a. it is not critically endangered or endangered; and b. it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
CD	**Conservation Dependent Species** A native species is eligible to be included in the conservation dependent category at a particular time if, at that time: a. the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or b. the following subparagraphs are satisfied: i. the species is a species of fish; ii. the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; iii. the plan of management is in force under a law of the Commonwealth or of a State or Territory; iv. cessation of the plan of management would adversely affect the conservation status of the species.

Threatened Ecological Communities

Threatened Ecological Communities may be listed under Section 181 of the EPBC Act in any one of the following categories.

A.5 Commonwealth listed Threatened Ecological Community categories

Code	Conservation Category
CR	**Critically Endangered Communities** An ecological community is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
EN	**Endangered Communities** An ecological community is eligible to be included in the endangered category at a particular time if, at that time: a. it is not critically endangered; and b. it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
VU	**Vulnerable Communities** An ecological community is eligible to be included in the vulnerable category at a particular time if, at that time: a. it is not critically endangered nor endangered; and b. it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.

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Appendix B Conservation Significant Flora and Fauna Likelihood Assessment

Table B.6 Conservation significant flora identified by database searches and their likelihood of presence in the Survey Area

Taxon FAMILY	State	Cth	Description	Likelihood of Occurrence	Reassessment Post-field
Acacia ataxiphylla subsp. *ataxiphylla* FABACEAE	P3	Not listed	Prostrate, sprawling shrub, 0.15-0.5 m high, to 1 m wide. Fl. yellow, Nov to Dec or Jan. Gravelly clay loam, white/grey sand. Flats, roadsides.	Likely based on nearby records and presence of preferred habitat	Unlikely based on habitat preferences
Acacia prismifolia FABACEAE	CR	EX	Shrub, 0.15-0.5 m high. Rocky slopes.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Adenanthos x cunninghamii PROTEACEAE	P4	Not listed	Erect open shrub, 1-3 m high. Fl. red/pink-red, Mar or Sep to Oct. Grey sand. Coastal dunes & sandplains.	Likely based on nearby records and presence of preferred habitat	Unlikely based on habitat preferences
Agrostocrinum scabrum subsp. *littorale* HEMEROCALLIDACEAE	P2	Not listed	Rhizomatous, perennial, herb, to 0.15 m high. Fl. blue, Oct to Nov. Shallow granite loams. Coastal slopes.	Likely based on nearby records and presence of preferred habitat	Unlikely based on habitat preferences
Andersonia auriculata ERICACEAE	P3	Not listed	Erect or spreading shrub, 0.1-0.3(-0.5) m high. Fl. white & blue, Apr to Oct. Grey or peaty sand, often over laterite. Swampy areas, granite outcrops.	Possible based on habitat preferences	Unlikely based on habitat preferences
Andersonia setifolia ERICACEAE	P3	Not listed	Decumbent to erect, cushion-forming shrub, 0.05-0.15 m high. Fl. red/white, Jun to Oct. Sandy & gravelly soils. Hillslopes & breakaways.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Andersonia sp. Jamesii (J. Liddelow 84) ERICACEAE	P4	Not listed	No description available	Possible based on regional distribution	Unlikely based on habitat preferences
Anzybas abditus ORCHIDACEAE	P3	Not listed	Tuberous herb to 0.02 m high. Fl. Oct to early-Nov. Peaty soils in seasonally wet flats and drainage lines.	Possible based on habitat preferences	Possible based on habitat preferences Could have been missed among dense vegetation

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Taxon FAMILY	State	Cth	Description	Likelihood of Occurrence	Reassessment Post-field
Asplenium decurrens ASPLENIACEAE	P4	Not listed	Rhizomatous fern growing to 0.6 m high. Sheltered sites close to the sea.	Possible based on habitat preferences	Possible based on habitat preferences Could have been missed among dense vegetation
Austrostipa mundula POACEAE	P3	Not listed	Perennial grass to 0.6 m high.	Possible based on regional distribution	Possible based on regional distribution Could have been missed among dense vegetation
Banksia brownii PROTEACEAE	CR	CR	Bushy, non-lignotuberous shrub or tree (small), 1-6 m high. Fl. cream & brown/orange-red, Mar to Jul. Sand over laterite, gravel, loam over granite. In gullies.	Likely based on nearby records and presence of preferred habitat	Unlikely based on habitat preferences.
Banksia goodii PROTEACEAE	VU	VU	Lignotuberous, prostrate shrub, ca 0.2 m high. Fl. orange-brown-red, May or Nov. White or grey sand over laterite.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Banksia seneciifolia PROTEACEAE	P4	Not listed	Columnar,non-lignotuberous shrub, 0.6-1 m high. Fl. cream-yellow-brown, Jun or Aug. Sandy loam, sand. Rocky hillslopes.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Banksia serra PROTEACEAE	P4	Not listed	Columnar,non-lignotuberous shrub, 0.6-1 m high. Fl. cream-yellow-brown, Jun or Aug. Sandy loam, sand. Rocky hillslopes.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Banksia verticillata PROTEACEAE	CR	VU	Non-lignotuberous shrub or tree (rarely), 1.3-6 m high. Fl. yellow-orange, Jan to Apr. Sandy loam. On or beside granite outcrops.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Boronia crassipes RUTACEAE	P3	Not listed	Erect, spindly shrub, 0.5-2 m high. Fl. red-pink, Aug to Sep. Sand, peaty sand. Winter-wet swamps, creeklines.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Smaller plants could have been missed among dense vegetation
Bossiaea sp. Mt Frankland (L. Graham 2174) FABACEAE	P2	Not listed	No description available.	Possible based on regional distribution	Possible based on regional distribution Smaller plants could have been missed among dense vegetation

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Taxon FAMILY	State	Cth	Description	Likelihood of Occurrence	Reassessment Post-field
Caladenia evanescens ORCHIDACEAE	P1	Not listed	Tuberous, perennial, herb, 0.15-0.2 m high. Fl. green-cream-yellow, Nov. Sand. Consolidated sand dunes.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Caladenia granitora ORCHIDACEAE	EN	EN	Tuberous, perennial, herb, 0.2-0.35 m high. Fl. cream & white & red, Oct to Nov. Shallow soil crevices on granite. Coastal areas.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Caladenia harringtoniae ORCHIDACEAE	VU	VU	Tuberous, perennial, herb, 0.2-0.4 m high. Fl. pink, Oct to Nov. Sandy loam. Winter-wet flats, margins of lakes, creeklines, granite outcrops.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Could have been missed among dense vegetation
Calandrinia sp. Torndirrup (S.D. Hopper et al. SDH 8712) MONTIACEAE	P2	Not listed	No description available.	Possible based on regional distribution	Possible based on regional distribution Could have been missed among dense vegetation
Calectasia cyanea DASYPOGONACEAE	CR	CR	Rhizomatous, clump forming, woody perennial, herb, 0.1-0.6 m high, to 0.3 m wide. Fl. blue/purple, Jun to Oct. White, grey or yellow sand, gravel.	Likely based on nearby records and presence of preferred habitat	Unlikely based on habitat preferences
Caustis sp. Boyanup (G.S. McCutcheon 1706) CYPERACEAE	P3	Not listed	Rhizomatous, clumped perennial, grass-like or herb (sedge), 0.7-1 m high. White or grey sand.	Possible based on habitat preferences	Unlikely based on habitat preferences
Chordifex abortivus RESTIONACEAE	VU	EN	Rhizomatous, erect perennial, herb, to 0.5 m high. Fl. brown, Sep to Oct. Sand. Low rises & undulating areas.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Chorizema carinatum FABACEAE	P3	Not listed	Erect or spreading shrub, 0.1-0.6 m high. Fl. yellow, Oct to Dec. Sand, sandy clay.	Likely based on nearby records and presence of preferred habitat	Unlikely based on habitat preferences
Conospermum quadripetalum PROTEACEAE	CR	Not listed	Diffuse, straggly shrub, 0.3-1 m high. Fl. blue/white, Sep to Nov. Sandy clay, grey sand. Flats behind coastal hills.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Smaller plants could have been missed among dense vegetation

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Taxon FAMILY	State	Cth	Description	Likelihood of Occurrence	Reassessment Post-field
Conospermum spectabile PROTEACEAE	P2	Not listed	Erect, compact shrub, 0.5-0.8 m high. Fl. white & blue, Oct to Nov. Sandy soils.	Likely based on nearby records and presence of preferred habitat	Unlikely based on habitat preferences
Conostylis misera HAEMODORACEAE	VU	EN	Rhizomatous, tufted perennial, grass-like or herb, 0.05-0.18 m high. Fl. yellow, Oct to Nov. White or grey sand, sandy loam. Winter-wet flats.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Could have been missed among dense vegetation
Corysanthes limpida ORCHIDACEAE	P4	Not listed	Tuberous herb to 0.02 m high. Fl. July to early-Sep. Peaty soils in seasonally damp flats.	Possible based on habitat preferences	Possible based on habitat preferences Could have been missed among dense vegetation
Diuris drummondii ORCHIDACEAE	EN	VU	Tuberous, perennial, herb, 0.5-1.05 m high. Fl. yellow, Nov to Dec or Jan. Low-lying depressions, swamps.	Possible based on habitat preferences	Possible based on habitat preferences Could have been missed among dense vegetation
Drakaea micrantha ORCHIDACEAE	EN	VU	Tuberous, perennial, herb, 0.15-0.3 m high. Fl. red & yellow, Sep to Oct. White-grey sand.	Possible based on habitat preferences	Unlikely based on habitat preferences
Drosera fimbriata DROSERACEAE	P4	Not listed	Erect tuberous, perennial, herb, 0.05-0.15 m high. Fl. white, Sep to Oct. White sand, granite.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Drosera paleacea DROSERACEAE	P1	Not listed	Fibrous-rooted, rosetted perennial, herb, to 0.03 m high, to 0.015 m wide. Fl. white-cream, Sep to Dec or Jan. White sand, sandy clay.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Could have been missed among dense vegetation
Eucalyptus newbeyi MYRTACEAE	P3	Not listed	Tree, 5-8 m high, bark smooth. Fl. yellow-green, Sep to Dec or Jan to Feb. Sandy clay, loam. Steep spongolite valley sides & cliffs forming river banks.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Eucalyptus x missilis MYRTACEAE	P4	Not listed	(Mallee), to 3 m high, bark smooth. Fl. yellow/cream-white, Jan to Apr. Sand over limestone or granite. Coastal sites.	Possible based on habitat preferences	Unlikely based on habitat preferences
Gahnia sclerioides CYPERACEAE	P4	Not listed	Lax, slender rhizomatous, perennial, grass-like or herb (sedge), 0.3-0.9 m high. Loam, sandy soils. Moist shaded situations.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Could have been missed among dense vegetation

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Taxon FAMILY	State	Cth	Description	Likelihood of Occurrence	Reassessment Post-field
Gonocarpus pusillus HALORAGACEAE	P4	Not listed	Prostrate annual, herb, 0.05-1.2 m high. Fl. green/yellow-red, Nov to Dec. Grey sandy clay. Winter-wet swamps.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Smaller plants could have been missed among dense vegetation
Gonocarpus simplex HALORAGACEAE	P4	Not listed	Tufted perennial, herb, 0.2-0.6 m high. Fl. green/red-brown, Nov to Dec. Peaty sand. Swamps, seasonally inundated areas.	Possible based on habitat preferences	Possible based on habitat preferences Could have been missed among dense vegetation
Goodenia sp. South Coast (A.R. Annels ARA 1846) GOODENIACEAE	P3	Not listed	Slender, erect herb, 0.3-0.45 m high. Fl. blue, Nov to Dec. Gravelly loams, sandy clays. Edge granite outcrop, roadside.	Possible based on habitat preferences	Possible based on habitat preferences Could have been missed among dense vegetation
Gyrostemon thesioides GYROSTEMONACEAE	P2	Not listed	Straggling, decumbent shrub, to 0.7 m high. Fl. red-orange-yellow/yellow-green, Nov. Sand over limestone. Consolidated coastal dunes.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Hakea lasiocarpha PROTEACEAE	P3	Not listed	Erect shrub, to 6 m high. Fl. white, May to Jul. Sandy loam soils, organic litter over sand, clay or gravel. Hill tops, valleys.	Possible based on habitat preferences	Unlikely to have been missed by survey due to its size.
Hydrocotyle serendipita ARALIACEAE	P2	Not listed	Annual herb to 0.1 m high and 0.5 m wide. Fl. White to pale pink, Oct to Dec. Fire ephemeral, grey-black or orange-brown sand. Gullies and base of outcropping granite.	Possible based on habitat preferences	Possible based on habitat preferences Could have been missed among dense vegetation
Isopogon buxifolius var. *buxifolius* PROTEACEAE	EN	Not listed	Upright shrub, 0.3-1.7 m high. Fl. pink/blue-purple/cream-white-green, May to Dec. Sandy soils, gravelly loam or clay. Sandplains, wet or swampy areas.	Possible based on habitat preferences	Possible based on habitat preferences Could have been missed among dense vegetation
Isopogon uncinatus PROTEACEAE	CR	EN	Tufted spreading or prostrate, non-lignotuberous shrub, 0.05-0.4 m high. Fl. yellow/cream, Oct to Nov. Loam or sand on granite, peaty sand. Swampy depressions, hillslopes.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Could have been missed among dense vegetation
Juncus meianthus JUNCACEAE	P3	Not listed	Tufted perennial, herb, 0.05-0.2 m high, to 0.4 m wide. Fl. brown, Nov to Dec or Jan. Black sand, sandy clay. Creeks, seepage areas.	Possible based on habitat preferences	Possible based on habitat preferences

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Taxon FAMILY	State	Cth	Description	Likelihood of Occurrence	Reassessment Post-field
					Could have been missed among dense vegetation
Kennedia glabrata FABACEAE	VU	VU	Prostrate shrub, 0.05-0.5 m high, to 5 m wide. Fl. red, Aug to Nov. Soil pockets, sandy soils. Granite outcrops.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Kunzea pauciflora MYRTACEAE	P4	Not listed	Erect, compact shrub, (0.35-)0.5-1.2(-1.5) m high. Fl. pink, Aug to Nov. Gravelly sandy or loamy soils over limestone, sandstone or spongolite. Hillsides, coastal slopes.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Lachnagrostis billardierei subsp. *billardierei* POACEAE	P3	Not listed	Annual, herb. Fl. purple/green, Dec. Sand over granite. Hilltops.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Lasiopetalum sp. Denmark (B.G. Hammersley 2012) MALVACEAE	P3	Not listed	No description available	Possible based on regional distribution	Possible based on regional distribution Could have been missed among dense vegetation
Lepidium pseudotasmanicum BRASSICACEAE	P4	Not listed	Erect annual or biennial, herb, 0.2-0.4(-1) m high. Fl. white-green, Feb or Dec. Loam, sand.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Could have been missed among dense vegetation
Leucopogon alternifolius ERICACEAE	P3	Not listed	Erect or semi-erect, scrambling shrub, 0.1-1(-2) m high. Fl. white/white-pink, Aug to Dec. Grey/white sand. Swampy areas, seasonally wet areas.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Smaller plants could have been missed among dense vegetation
Leucopogon altissimus ERICACEAE	P3	Not listed	Erect shrub to 1.5 m high. Fl. Cream, Aug to Oct. Sand, loam, seasonally wet areas, outcropping granite.	Possible based on habitat preferences	Possible based on habitat preferences Smaller plants could have been missed among dense vegetation
Leucopogon bracteolaris ERICACEAE	P2	Not listed	Shrub, 0.25-1 m high. Fl. white, Feb or May or Jul or Oct. Stony sand, gravelly loam.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Smaller plants could have been missed among dense vegetation

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Taxon FAMILY	State	Cth	Description	Likelihood of Occurrence	Reassessment Post-field
Lysinema lasianthum ERICACEAE	P4	Not listed	Spindly shrub, 0.25-0.7 m high. Fl. white-cream, Jul to Nov. Swamps, seasonally wet areas.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Could have been missed among dense vegetation
Microtis globula ORCHIDACEAE	EN	VU	Tuberous, perennial, herb, 0.18-0.35 m high. Fl. yellow-green, Dec or Jan. Peaty soils. Winter-wet swamps.	Possible based on habitat preferences	Possible based on habitat preferences Could have been missed among dense vegetation
Microtis pulchella ORCHIDACEAE	P4	Not listed	Tuberous, perennial, herb, 0.12-0.25 m high. Fl. white, Nov to Dec or Jan. Peaty sand. Winter-wet swamps.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Could have been missed among dense vegetation
Microtis quadrata ORCHIDACEAE	P4	Not listed	Tuberous perennial herb to 0.8 m high. Fl. Dec-Jan. Clayey soils. Swamps.	Likely based on nearby records	Possible based on habitat preferences Could have been missed among dense vegetation
Poa billardierei POACEAE	P3	Not listed	Tussock grass to 1.3 m high. Fl. Sep to Nov. White sands. Coastal Dunes.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Prasophyllum paulinae ORCHIDACEAE	P1	Not listed	Tuberous herb to 0.25 m high. Fl. Yellowish-green and purple, Sep to Nov. Seasonally wet flats.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Could have been missed among dense vegetation
Pterostylis heberlei ORCHIDACEAE	P2	Not listed	Tuberous herb to 0.4 m high. Fl. Brown, green and white, Aug to early-Oct. Sandy soils.	Possible based on habitat preferences	Unlikely based on habitat preferences
Schoenus sp. Grassy (E. Gude & J. Harvey 250) CYPERACEAE	P2	Not listed	Rhizomatous, perennial, grass-like or herb (sedge), to 0.7 m high. Fl. yellow. Black silt. Swamps.	Possible based on habitat preferences	Possible based on habitat preferences Could have been missed among dense vegetation
Schoenus sp. Grey Rhizome (K.L. Wilson 2922) CYPERACEAE	P1	Not listed	Grass-like or herb (sedge), 0.06-0.08 m high. Sandy clay, sand.	Possible based on habitat preferences	Unlikely based on habitat preferences
Sphenotoma drummondii ERICACEAE	EN	EN	Tufted shrub, 0.15-0.5 m high. Fl. white, Sep to Dec. Stony or shallow soils over granite or quartzite. Steep rocky slopes, crevices of rocks.	Unlikely based on habitat preferences	Unlikely based on habitat preferences

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Taxon FAMILY	State	Cth	Description	Likelihood of Occurrence	Reassessment Post-field
Spyridium spadiceum RHAMNACEAE	P4	Not listed	Erect slender or weak semi-prostrate shrub, 0.15-3 m high. Fl. white, Aug to Dec or Jan to Feb or Apr. Sand or gravelly loam. Granitic hills.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Stenanthemum sublineare RHAMNACEAE	P2	Not listed	Erect shrub, to 0.1 m high. Fl. green, Oct to Dec. Littered white sand. Coastal plain.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Stylidium articulatum STYLIDIACEAE	P2	Not listed	Rosetted perennial, herb, 0.15-0.25 m high. Fl. pink, Nov to Dec. Sandy loam, granite. Hills, coastal heath.	Likely based on nearby records and presence of preferred habitat	Unlikely based on habitat preferences
Stylidium falcatum STYLIDIACEAE	P2	Not listed	Perennial, herb, 0.15-0.35(-0.6) m high. Fl. white, Oct to Nov. Sand, gravelly clay loam. Plains, lateritic ridges.	Likely based on nearby records and presence of preferred habitat	Unlikely based on habitat preferences
Styphelia cymbiformis ERICACEAE	P2	Not listed	Sprawling perennial shrub to 0.7 m high. Fl. white to pink, Nov to Dec. Varied habitats.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Smaller plants could have been missed among dense vegetation
Synaphea incurva PROTEACEAE	P3	Not listed	Clumped, spreading shrub. Fl. yellow, Sep to Nov. Gravelly loam, sandy soils. Slopes.	Possible based on habitat preferences	Unlikely based on habitat preferences
Synaphea preissii PROTEACEAE	P3	Not listed	Erect, low shrub, 0.15-0.4 m high. Fl. yellow, Jul to Nov. Sand, gravelly loam.	Likely based on nearby records and presence of preferred habitat	Unlikely based on habitat preferences
Thelymitra porphyrosticta ORCHIDACEAE	P2	Not listed	Tuberous herb to 0.35 m high. Fl. Purple, mauve, orange and yellow, Aug-Sep. Sandy soils.	Likely based on nearby records and presence of preferred habitat	Unlikely based on habitat preferences
Thomasia multiflora MALVACEAE	P1	Not listed	Spreading shrub, 0.3-1 m high, to 2 m wide. Fl. pink-purple, Sep to Oct. Black sand. Seasonally wet areas, granite outcrops.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Smaller plants could have been missed among dense vegetation
Thomasia purpurea x solanacea MALVACEAE	P1	Not listed	Shrub, 0.5-0.8 m high. Fl. pink-purple, Nov to Dec or Jan. Grey sand over limestone. Creek sides.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Thomasia quercifolia	P4	Not listed	Shrub, ca 1 m high.	Possible based on regional distribution	Possible based on regional distribution

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Taxon FAMILY	State	Cth	Description	Likelihood of Occurrence	Reassessment Post-field
MALVACEAE					Smaller plants could have been missed among dense vegetation
Thomasia solanacea MALVACEAE	P4	Not listed	Erect shrub, 0.5-3 m high. Fl. blue-purple-pink, Sep to Dec. Alluvium, sand over limestone, rocky loam. Coastal areas.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Smaller plants could have been missed among dense vegetation
Thysanotus gageoides ASPARAGACEAE	P3	Not listed	Perennial, herb (with tuberous roots), to 0.2 m high. Fl. purple, Oct to Nov. Sand, clay, granite, sandstone, laterite.	Possible based on habitat preferences	Unlikely based on habitat preferences
Thysanotus isantherus ASPARAGACEAE	P4	Not listed	Caespitose perennial, herb (with tuberous roots), to 0.15 m high. Fl. purple, Nov to Dec. Granite.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Verticordia endlicheriana var. *angustifolia* MYRTACEAE	P3	Not listed	Erect shrub, 0.3-0.5 m high. Fl. yellow, Oct to Nov. Sandy clay. Granite outcrops.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Verticordia fimbrilepis subsp. *australis* MYRTACEAE	EN	VU	Slender shrub, 0.2-0.4 m high. Fl. pink, Oct to Dec. Shallow sand, clay loam. Granite outcrops.	Unlikely based on habitat preferences	Unlikely based on habitat preferences

Table B.2 Conservation significant fauna identified by database searches and their likelihood of presence in the Survey Area

Taxon Common Name COM_NAME	State	Cth	Habitat	Likelihood of Occurrence
BIRDS				
Actitis hypoleucos Common Sandpiper	MI	MI	Occurs in a wide variety of habitats on the shores of waterbodies (Pizzey & Knight, 1997). Shallow, pebbly, muddy or sandy edges of rivers and streams, coastal to far inland; dams, lakes, sewage ponds, margins of tidal rivers, waterways in mangroves or saltmarsh; mudflats; rocky or sandy beaches, causeways, riverside lawns, drains, street gutters.	Regular migrant or visitor; recorded on the rocks fringing the Survey Area
Aphelocephala leucopsis Southern Whiteface	Not listed	VU	Occurs across most of mainland Australia south of the tropics, in a wide range of open woodlands and shrublands where there is an understory of grasses, shrubs	Absent - out of range

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Taxon Common Name COM_NAME	State	Cth	Habitat	Likelihood of Occurrence
			or both. Habitats are usually dominated by Acacias or eucalypts on ranges, foothills, lowlands and plains. They nest in hollows and crevices of trees (TSSC, 2023).	
Apus pacificus Fork-tailed Swift, Pacific Swift	MI	MI	Airborne over a variety of habitats from rainforest to arid areas (Pizzey & Knight, 1997). Aerial: open country, from semi-deserts to coasts, islands; sometimes over forests, cities (Pizzey & Knight 2012).	Vagrant
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater	VU	MI	Temperate to tropical waters, breeding on islands off southern WA, also SA and Lord Howe. Often attracted to fishing vessals. Trans-equatorial migrant in Pacific and Indian oceans, largely absent May-Sep.	Vagrant
Ardenna grisea Sooty shearwater	MI	MI	Warm-temperate to cold subantarctic oceans. In Australia, breeds on offshore islands off NSW and Tasmania.	Vagrant
Ardenna tenuirostris Short-tailed shearwater	MI	MI	Inshore and offshore waters (Menkhorst, et al., 2019)	Vagrant
Arenaria interpres Ruddy turnstone	MI	MI	Occurs in a wide variety of habitats on the shores of waterbodies, commercial saltfields, open or ploughed ground (Pizzey & Knight, 1997). Coastal/marine (Pizzey & Knight 2012).	Regular migrant or visitor
Atrichornis clamosus noisy scrub-bird, tjimiluk	EN	EN	Dense, unburnt understorey vegetation of low forest, scrub thicket and occasionally heath that occur in gullies, drainage lines and lowland areas.	Locally extinct
Botaurus poiciloptilus Australasian bittern	EN	EN	Occurs in or over water in tall reedbeds, sedges, rushes or Typha; drains in tussocky paddocks, occasionally saltmarsh or brackish wetlands (Pizzey & Knight, 2012).	Locally extinct
Calidris acuminata Sharp-tailed sandpiper	MI	MI	Tidal mudflats, saltmarshes, mangroves; shallow fresh, brackish or saline inland wetlands; floodwaters, irrigated pastures and crops; sewage ponds, saltfields (Pizzey & Knight, 2012).	Regular migrant or visitor
Calidris alba Sanderling	MI	MI	Broad ocean beaches of firm sand 'where waves ebb and flow', depositing strands and heaps of seaweed; often near river mouths; also inlets, tidal mudflats, coastal lagoons (Pizzey & Knight, 2012).	Regular migrant or visitor

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Taxon Common Name COM_NAME	State	Cth	Habitat	Likelihood of Occurrence
Calidris canutus Red knot	EN	EN	Tidal mudflats, sandflats, beaches, saltmarshes, flooded pastures and ploughed lands (Pizzey & Knight, 1997).	Regular migrant or visitor
Calidris ferruginea curlew sandpiper	CR	MI	Tidal mudflats, saltmarsh, saltfields; fresh, brackish or saline wetlands and sewage ponds (Pizzey & Knight, 1997).	Regular migrant or visitor
Calidris ruficollis red-necked stint	MI	MI	Tidal mudflats, saltmarshes; sandy or shelly beaches; saline and freshwater wetlands, coastal and inland; saltfields, sewage ponds (Pizzey & Knight, 2012).	Regular migrant or visitor; recorded on adjacent mud flats
Calidris subminuta Long-toed Stint	MI	MI	Tussocky, weedy margins of shallow wetlands, both coastal and inland, sewage ponds, weed on tidelines, tidal mudflats (Pizzey & Knight, 2012).	Regular migrant or visitor
Calidris tenuirostris Great knot	CR	MI	Tidal mudflats, sandy ocean and bay shores, estuaries, shallow saline and freshwater wetlands (Pizzey & Knight, 1997).	Regular migrant or visitor
Calyptorhynchus banksii naso forest red-tailed black cockatoo	VU	VU	Marri, jarrah, wandoo, tuart and karri woodlands and forests, where they feed primarily on marri and jarrah (Johnstone & Kirkby, 2011).	Regular migrant or visitor; recorded adjacent
Cereopsis novaehollandiae grisea Cape Barren Goose, Recherche Cape Barren goose	VU	VU	Offshore islands, grassy patches among low scrub and rocks, beaches and headlands, pasture, shallow wetlands, irrigated crops (Menkhorst et al. 2019).	Absent - out of range
Charadrius leschenaultii Greater sand plover, large sand plover	VU	MI	Wide, sandy or shelly beaches; sandspits, tidal mudflats, reefs, sand cays, mangroves, saltmarsh, dunes, bare paddocks; seldom far inland (Pizzey & Knight, 2012).	Regular migrant or visitor
Charadrius mongolus Lesser Sand Plover	EN	MI	Tidal mudflats and sandflats; gently sloping sandy or shelly beaches, saltmarsh, estuaries, atolls, reefs, mangroves and airfields (Pizzey & Knight, 2012). . Occasionally found inland on freshwater lakes, swamps, bore drains etc.	Regular migrant or visitor
Dasyornis longirostris western bristlebird	EN	EN	Very restricted distribution, mostly between Two Peoples Bay and Wychinicup Inlet in dense, low, coastal heath.	Locally extinct
Diomedea antipodensis Antipodean Albatross	MI/EN	VU/MI	A sea bird, spending most of its time at sea. Does not breed in Australia (Menkorst et al. 2019).	Vagrant

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Taxon Common Name COM_NAME	State	Cth	Habitat	Likelihood of Occurrence
Diomedea dabbenena Tristan Albatross	CR	EN/MI	A seabird with a poorly understood distribution. Breeds on islands of the Tristan da Cunha archipelago (Pizzey & Knight, 2012).	Vagrant
Diomedea epomophora Southern Royal Albatross	VU	VU/MI	A seabird found in offshore waters. Does not breed in Western Australia (Pizzey & Knight, 2012).	Vagrant
Diomedea exulans Wandering Albatross	MI	VU	A seabird found in offshore waters south of Fremantle. Breeds at high latitudes in the S. Indian and S. Atlantic oceans (Pizzey & Knight, 2012).	Vagrant
Diomedea sanfordi Northern Royal Albatross	EN	EN/MI	A seabird which does not breed in Western Australia. Rarely seen from land (Menkhorst, et al., 2019).	Vagrant
Falco hypoleucos Grey Falcon	VU	VU	Inhabits open plains with treed watercourses in the arid inland (Menkhorst et al. 2019).	Vagrant
Falco peregrinus Peregrine falcon	OS	Not listed	Diverse habitats ranging from rainforest to the coast, alpine areas and arid shrublands (Pizzey & Knight, 1997). Cliffs, gorges, timbered watercourses, environs of rivers, wetlands, plains, open woodlands pylons, spires, buildings (Pizzey & Knight, 2012).	Regular migrant or visitor
Halobaena caerulea Blue Petrel	Not listed	VU	A seabird occurring offshore south of Fremantle. Breeds on sub-Antarctic islands (Pizzey & Knight, 2012).	Vagrant
Hydroprogne caspia Caspian Tern	MI	MI	Sheltered coastal bays with sandy or muddy margins, and near coastal or inland saline or brackish waterbodies (DCCEEW, 2023).	Irregular visitor; recorded on adjacent mudflats
Leipoa ocellata malleefowl	VU	VU	Mallee, Acacia, paperbark, sheoak and other scrubs, eucalypt woodland and coastal heaths, mainly on sandy or gravel soils (Pizzey & Knight, 2012).	Absent - out of range
Limosa lapponica Bar-tailed Godwit	MI	MI	Tidal mudflats, estuaries, sewage ponds, shallow river margins, brackish or saline inland lakes, flooded pastures and airfields (Pizzey & Knight, 1997).	Regular migrant or visitor
Limosa limosa Black-tailed Godwit	MI	MI	Shallow inland wetlands and on coast. Prefers sites with muddy substrates where it feeds by wading. Does not breed in Australia (Menkhorst et al. 2019).	Regular migrant or visitor
Macronectes giganteus Southern Giant Petrel	MI	EN	A seabird, breeding on Antarctic and sub-Antarctic islands (Pizzey & Knight, 1997)	Vagrant

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Taxon Common Name COM_NAME	State	Cth	Habitat	Likelihood of Occurrence
Macronectes halli Northern Giant Petrel	No listed	VU/MI	A seabird, breeding on sub-Antarctic islands. Common on inland and offshore waters from approximately south of Fremantle (Pizzey & Knight, 1997).	Vagrant
Numenius madagascariensis Eastern Curlew	CR	CR	Estuaries, tidal mudflats, sandspits, saltmarshes, mangroves, fresh or brackish lakes, grasslands near water (Pizzey & Knight, 1997).	Vagrant
Numenius phaeopus Whimbrel	MI	MI	Estuaries, mangroves, tidal flats, coral cays, exposed reefs, flooded paddocks, sewage ponds, bare grasslands, sportsgrounds, lawns (Pizzey & Knight, 2012).	Regular migrant or visitor
Oceanites oceanicus Wilson's Storm-petrel	MI	MI	Wilson's Storm-Petrel spends much of its life at sea (Marchant & Higgins 1990).	Vagrant
Oxyura australis Blue-billed Duck	P4	Not listed	Well vegetated freshwater swamps, large dams, lakes (Pizzey & Knight, 2012).	Regular migrant or visitor
Pachyptila turtur subantarctica Fairy Prion (southern)	Not listed	VU	A seabird found in offshore waters. Breeds on sub-Antarctic islands (Menkhorst, et al., 2019).	Vagrant
Pandion cristatus Osprey, Eastern Osprey	MI	MI	Coasts, inshore waters, tidal reaches of large streams (Menkhorst, et al., 2019).	Regular migrant or visitor; recorded on adjacent mudflats
Pezoporus flaviventris Western Ground Parrot	CR	CR	Dense heathland in Cape Arid National Park and southwest Western Australia.	Locally extinct
Phaethon rubricauda Red-Tailed Tropicbird	P4	EN/MI	Tropical pelagic waters, rarely near land unless breeding (Menkhorst et al. 2019).	Vagrant
Philomachus pugnax Ruff (Reeve)	MI	MI	Nests in marshes of the low Arctic. Occupies a variety of open, moist habitats. Grasslands, agricultural lands, freshwater wetlands (Menkhorst et al., 2019).	Vagrant
Phoebetria fusca Sooty Albatross	MI	MI	A seabird found in offshore waters. Breeds on sub-Antarctic islands (Pizzey & Knight, 2012).	Vagrant
Plegadis falcinellus Glossy Ibis	MI	MI	Well vegetated wetlands, wet pastures, ricefields, floodwaters, floodplains, brackish or saline wetlands, mangroves, mudflats and occasionally dry-grasslands (Pizzey & Knight, 2012).	Regular migrant or visitor

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Taxon Common Name COM_NAME	State	Cth	Habitat	Likelihood of Occurrence
Pluvialis fulva Pacific Golden Plover	MI	MI	Estuaries, mudflats, saltmarshes, mangroves, rocky reefs and stranded seaweed on ocean shores; margins of shallow open inland swamps; sewage ponds, short-grass paddocks, sportsgrounds, airfields, ploughed land (Pizzey & Knight, 2012).	Regular migrant or visitor
Pluvialis squatarola Grey Plover	MI	MI	Occurring almost entirely in coastal areas, inhabits sheltered bays, estuaries and lagoons with mudflats and sandflats, and occasionally on rocky coasts. They also occur around terrestrial wetlands such as near-coastal lakes and swamps, or salt-lakes (DCCEEW, 2023). Mudflats, saltmarsh; tidal reefs and estuaries; rarely inland (Pizzey & Knight, 2012).	Regular migrant or visitor; recorded on adjacent mudflats
Psophodes nigrogularis Western Whipbird	EN or P4	Not listed	Dense, low scrub, heath and mallee thickets 1-2 m tall with open space at ground level (Menkhorst et al., 2019).	Locally extinct
Psophodes nigrogularis nigrogularis Western Whipbird (Western Heath)	EN	EN	Dense, low scrub, heath and mallee thickets 1-2 m tall with open space at ground level (Menkhorst et al., 2019).	Locally extinct
Pterodroma mollis Soft-plumaged Petrel	Not listed	VU	A seabird found in offshore waters. Breeds on sub-Antarctic islands (Pizzey & Knight, 2012).	Vagrant
Puffinus huttoni Hutton's shearwater	EN	Not listed	Tropical inshore waters and offshore. Breeds in New Zealand mountains.	Vagrant
Stercorarius antarcticus lonnbergi Brown Skua, Subantarctic Skua	P4	Not listed	Strictly marine birds in the Australian region. Apr-Sep off the south of Western Australia, can be seen in larger aggregations near to dead seals, Gannet populations etc. Rarely seen ashore.	Vagrant
Stercorarius maccormicki South polar Skua	MI	MI	Circumpolar seabird nesting on Antarctic shorelines (Menkhorst et al., 2019).	Vagrant
Stercorarius parasiticus Arctic Jaeger, Arctic Skua	MI	MI	Trans-equatorial migrant, prefers inshore waters, enters bays. Less common in offshore waters.	Vagrant
Sternula nereis nereis Australian Fairy Tern	Not listed	VU	Coastal waters, bays, inlets, saline or brackish lakes, saltfields, sewage ponds near coast (Pizzey & Knight, 2012).	Regular migrant or visitor; recorded on adjacent mudflats

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Taxon Common Name COM_NAME	State	Cth	Habitat	Likelihood of Occurrence
Thalassarche carteri Indian Yellow-nosed Albatross	EN	VU	A seabird found in offshore waters. Breeds on sub-Antarctic islands (Pizzey & Knight, 2012).	Vagrant
Thalassarche cauta cauta Shy Albatross	VU	EN/MI	A seabird found in offshore waters. Breeds on Albatross Is. Bass Strait (Pizzey & Knight, 2012).	Vagrant
Thalassarche chlororhynchos Atlantic Yellow-nosed Albatross	MI	MI	A seabird with a poorly understood distribution. Breeds on Gough Is. and islands of the Tristan da Cunha archipelago (Pizzey & Knight, 2012).	Vagrant
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross	Not listed	VU/MI	A seabird found in offshore waters. Breeds on Campbell Is. (New Zealand region) (Pizzey & Knight, 2012).	Vagrant
Thalassarche melanophris Black-Browed Albatross	MI	MI	A seabird found in offshore waters. Breeds on sub-Antarctic islands (Menkhorst, et al., 2019).	Vagrant
Thalassarche steadi White-capped Albatross	Not listed	VU/MI	A seabird found in offshore waters. Breeds on Auckland Is. Group and Antipodes Is. (New Zealand region) (Pizzey & Knight, 2012).	Vagrant
Thalasseus bergii Crested Tern	MI	MI	Coastal, offshore waters; beaches, bays, inlets, tidal rivers, salt swamps, lakes and larger rivers (Pizzey & Knight, 2012).	Regular migrant or visitor; recorded on adjacent mudflats
Thinornis rubricollis Hooded Plover, Hooded Dotterel	P4	Not listed	Broad sandy ocean beaches with plentiful seaweed, and adjacent dunes; weedy rock shelves and reefs, occasionally tidal flats; coastal and inland salt lakes (Pizzey & Knight, 2012).	Regular migrant or visitor
Tringa brevipes Grey-tailed Tattler	P4	MI	The Grey-tailed Tattler is often found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. It can also be found at intertidal rocky, coral or stony reefs as well as platforms and islets that are exposed at low tide. It has been found around shores of rock, shingle, gravel or shells and also on intertidal mudflats in embayments, estuaries and coastal lagoons, especially fringed with mangroves. In Moreton Bay, Queensland, it is most abundant in areas with dense beds of seagrass. In Tasmania it is also abundant in areas with seagrass beds. It is less often on open flat sandy beaches or sandbanks, especially around accumulated seaweed or isolated clumps of dead coral. It is occasionally found around near-coastal wetlands, such as lagoons and lakes and	Regular migrant or visitor

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Taxon Common Name COM_NAME	State	Cth	Habitat	Likelihood of Occurrence
			ponds in sewage farms and saltworks. Inland records for the species are rare with sightings on river banks and the edges of rock pools (Higgins & Davies 1996).	
Tringa glareola Wood Sandpiper	MI	MI	Muddy wetland margins, tidal mangroves, margins of tidal mudflats, saltmarshes and sewage ponds (Pizzey & Knight, 2012).	Regular migrant or visitor
Tringa nebularia Common Greenshank, Greenshank	MI	MI	Mudflats, estuaries, saltmarshes, margins of lakes; wetlands, fresh and saline claypans, saltfields and sewage ponds (Pizzey & Knight, 2012).	Regular migrant or visitor
Tringa stagnatilis Marsh Sandpiper, Little Greenshank	MI	MI	Wetlands (freshwater, salt or brackish), sewage ponds, saltfields, bore drains, mangroves, tidal mudflats, estuaries (Pizzey & Knight, 2012).	Regular migrant or visitor
Tyto novaehollandiae novaehollandiae Masked Owl (southwest)	P3	Not listed	Inhabits a variety of forests and woodlands, roosting in tree hollows, dense foliage or caves.	Irregular visitor
Xenus cinereus Terek Sandpiper	MI	MI	Tidal mudflats, estuaries; shores and reefs of islands; coastal swamps, commercial saltfields.	Regular migrant or visitor
Zanda baudinii Baudin's Cockatoo	EN	EN	Eucalypt forests, especially marri-jarrah and karri forests, less commonly in woodlands of wandoo, blackbutt, flooded gum, yate, and cleared areas (Johnstone & Kirkby, 2011).	Regular migrant or visitor
Zanda latirostris Carnaby's Cockatoo	EN	EN	Forests, woodlands and shrublands of Eucalyptus and Proteaceae species, where they feed primarily on Banksia, Hakea and marri, pine plantations and urban areas (Johnstone, et al., 2011; Pizzey & Knight, 1997).	Regular migrant or visitor
FISH				
Galaxias truttaceus (Western Australian population) Western Trout Minnow, Western Spotted Galaxias	EN	EN	On the south coast in near-coastal freshwater rivers and their tributaries and associated downstream lakes. The species is tolerant of tannin-stained acidic waters.	Potentially resident

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Taxon Common Name COM_NAME	State	Cth	Habitat	Likelihood of Occurrence
Galaxiella munda Mud Minnow, Western Dwarf Galaxias	VU	Not listed	Swift flowing streams within karri forests and is typically found near submerged vegetation, occasionally in the still water of ponds, swamps and roadside drains, and often inhabiting darkly tannin-stained and acidic water.	Potentially resident
Galaxiella nigrostriata Black-Stripe Minnow, Black-Striped Dwarf Galaxias	EN	EN	Acidic ephemeral wetlands of the south-west of Western Australia. Generally prefer sandy soils (has been shown to be more suited for burrowing). Has been documented to survive in both natural wetlands, as well as excavated roadside pools.	Potentially resident
Geotria australis Pouched Lamprey	P3	Not listed	South-west coast, spawning in rivers.	Absent - no habitat
Lepidogalaxias salamandroides Salamanderfish	EN	Not listed	Pools in sandy peat flat areas. These waters are usually darkly tannin stained and often very acidic (pH 3.0-6.5).	Potentially resident
Nannatherina balstoni Balston's Pygmy Perch	VU	VU	Inundated riparian vegetation, in pools that often dry up in coastal flats of the South-west. Has also been found in the Collie River.	Potentially resident
INVERTEBRATES				
Cynotelopus notabilis Western Australian Pill Millipede	EN	Not listed	A short range endemic inhabiting deep litter, esp. karri bark, and under logs or rocks associated with granite tors (Main et al., 2002).	Unlikely - habitat dubious
Helicarion castanea a Helicarionid land snail	EX	Not listed	No information available. Last collected in 1925 near the Preston River.	Locally extinct
Hylaeus globuliferus Woolybush Bee	P3	Not listed	This native bee is distributed across the south-west of western Australia, with 223 records in the Atlas of Living Australia (ALA 2023). *Hylaeus globuliferus* is known to be associated with *Adenanthos cygnorum* and *Banksia attenuata* amongst other native plants (Houston 2018)	Absent - no habitat
Trioza barrettae Banksia brownii Plant-louse	EN	EN	Associated with its host plant *Banksia brownii*, which is associated with a range of habitats including thickets and mallee-heath and mallee heath shrublands and woodlands that are rich in proteaceous and myrtaceous species.	Absent - no habitat

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Taxon Common Name COM_NAME	State	Cth	Habitat	Likelihood of Occurrence
Westralunio carteri Carter's Freshwater Mussel	VU	VU	Perennial streams, rivers, lakes and reservoirs, occasionally swamps with a salinity of <1.6 g/L and sediments composed of sand/mud/clay which are soft enough for burrowing, but stable enough for support.	Absent - no habitat
Zephyrarchaea mainae Main's Assassin Spider	VU	Not listed	Known from Walpole-Nornalup National Park (near Walpole) east to Bremer Bay and north to the Porongurup National Park, with a range centred on the Torndirrup Peninsula south of Albany. Specimens have been collected by beating and sifting sedges *(Lepidosperma* sp.), curly grass (*Empodisma gracillimum*) and low shrubs in dense coastal or near-coastal groves of Peppermint, with several outlying populations also known from wet Karri forest (Rix and Harvey, 2012).	Potentially resident
MAMMALS				
Arctocephalus forsteri New Zealand Fur-seal, Long-Nosed Fur-seal	OS	Not listed	Oceanic waters and rocky islands off the coast.	Unlikely visitor
Arctocephalus tropicalis Subantarctic Fur-seal	VU	Not listed	Oceanic waters and rocky islands off the coast.	Unlikely visitor
Bettongia penicillata ogilbyi Woylie, Brush-Tailed Bettong	CR	EN	Open, sclerophyllous forests and woodlands with a dense understorey/ground cover of tussock grasses or woody scrub (DBCA, 2017).	Potentially resident, but low likelihood
Dasyurus geoffroii Chuditch, Western Quoll	VU	VU	Forests, mallee shrublands, heathlands and woodlands (DBCA, 2017), with a preference for riparian locations in the jarrah forest (DEC, 2012).	Irregular visitor
Falsistrellus mackenziei Western False Pipistrelle, Western Falsistrelle	P4	Not listed	Mostly Karri wet sclerophyll forest or high-rainfall zones of Jarrah forest; also Tuart forest and adjacent woodlands. Roosts in tree hollows (van Dyke et al., 2013).	Irregular visitor
Hydromys chrysogaster Water-rat, Rakali	P4	Not listed	Occurs in a variety of aquatic environments (Menkhorst & Knight, 2011).	Irregular visitor
Isoodon fusciventer Quenda, Southwestern Brown Bandicoot	P4	Not listed	Dense, scrubby, often swampy vegetation (DEC, 2012). Forest, woodland, shrub and heath communities, ideally with sandy soils and dense health vegetation in the lower stratum	Resident

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Taxon Common Name COM_NAME	State	Cth	Habitat	Likelihood of Occurrence
Limosa lapponica menzbieri Dibbler	CR	EN/MI	A wader occurring on tidal flats throughout Western Australia's coast. Does not breed in Western Australia (Menkhorst, et al., 2019).	Locally extinct
Macrotis lagotis Bilby, Dalgyte, Ninu	VU	VU	Mitchell grass and stony downs country of cracking clays. Also desert sandplains and dune fields, sometimes with spinifex hummock grasslands and Acacia shrubland.	Locally extinct
Neophoca cinerea Australian Sea-lion	VU	EN	Colonies found on near-shore islands. Females pup on rocky platforms, dunes and limestone crevices. Forages on continental shelf or shelf break.	Irregular visitor
Notamacropus eugenii derbianus Tammar Wallaby	P4	Not listed	Coastal scrub, heath, dry sclerophyll forest and thickets in mallee and woodland. Requires dense, low vegetation for daytime shelter and open, grassy areas for feeding.	Locally extinct
Notamacropus irma Western Brush Wallaby	P4	Not listed	Open forest or woodland with a preference for seasonally inundated flats with low grasses and open, scrubby thickets (van Dyck, et al., 2013).	Locally extinct
Parantechinus apicalis Dibbler	EN	EN	Mature mallee-heath on mainland; low heath scrubland on islands	Locally extinct
Phascogale tapoatafa wambenger South-western Brush-tailed Phascogale, Wambenger	CD	Not listed	Dry, sclerophyllous forests and open woodlands that contain hollow-bearing trees, with sparse ground cover (Anon., 2012).	Irregular visitor
Potorous gilbertii Gilbert's Potoroo	CR	CR	On Mt Gardner in *Melaleuca striata* heath with dense sedge understory on slopes; on Bald Island in Taxandria scrub near Eucalyptus stands (van Dyke et al., 2013).	Locally extinct
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir	CR	CR	Coastal and near coastal peppermint -tuart, jarrah-marri, sheoak and eucalypt woodland and mallee woodland (preferably closed-canopy) (DPaW, 2017).	Resident
Setonix brachyurus Quokka	VU	VU	Mainland: tea-tree bordering swamps/watercourses in the Jarrah forest and Karri forests. Rottnest Island: thickets of Acacia, Melaleuca and sedges as well as modified habitats (van Dyck et al. 2013).	Locally extinct

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Taxon Common Name COM_NAME	State	Cth	Habitat	Likelihood of Occurrence
REPTILES				
Elapognathus minor Short-nosed Snake	P2	Not listed	Heaths edging swamps. Shelters in low, dense vegetation such as tussocks and sedges (Wilson and Swan, 2023).	Potentially resident

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Appendix C Species List

Family	Taxon	Status	Notes
Apiaceae	*Centella asiatica*	Weed	
Araceae	*Lemna minor*	Weed	
Araceae	*Zantedeschia aethiopica*	Declared Pest - s22(2)	
Asparagaceae	*Asparagus asparagoides*	Weed	
Asparagaceae	*Yucca aloifolia*	Weed	
Asteraceae	*Cirsium vulgare*	Weed	
Asteraceae	*Cotula coronopifolia*	Weed	
Asteraceae	*Erigeron bonariensis*	Weed	
Asteraceae	*Hypochaeris glabra*	Weed	
Asteraceae	*Sonchus asper*	Weed	
Campanulaceae	*Lobelia anceps*		
Chenopodiaceae	Chenopodiaceae sp.		Sterile
Chenopodiaceae	*Rhagodia baccata* subsp. *baccata*		
Chenopodiaceae	*Tecticornia ?indica* subsp. *bidens*		
Chenopodiaceae	*Threlkeldia diffusa*		
Crassulaceae	*Crassula glomerata*	Weed	
Cupressaceae	Cupressaceae sp.	Weed	Fruit out of reach
Cyperaceae	*Ficinia nodosa*		
Cyperaceae	*Isolepis cernua* var. *setiformis*		
Cyperaceae	*Isolepis prolifera*		
Cyperaceae	*Lepidosperma gladiatum*		
Cyperaceae	*Machaerina articulata*		
Cyperaceae	*Machaerina juncea*		
Dennstaedtiaceae	*Pteridium esculentum*		
Dilleniaceae	*Hibbertia cuneiformis*		
Euphorbiaceae	*Euphorbia paralias*	Weed	
Fabaceae	*Acacia littorea*		
Fabaceae	*Acacia longifolia* subsp. *longifolia*	Weed	
Fabaceae	*Dipogon lignosus*	Weed	
Fabaceae	*Lotus subbiflorus*	Weed	
Fabaceae	*Psoralea pinnata*	Weed	
Geraniaceae	*Geranium molle*	Weed	
Geraniaceae	*Pelargonium capitatum*	Weed	
Iridaceae	*Watsonia meriana*	Weed	
Juncaceae	*Juncus ?kraussii* subsp. *australiensis*		
Juncaceae	*Juncus oxycarpus*	Weed	
Juncaceae	*Juncus pallidus*		

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Family	Taxon	Status	Notes
Lamiaceae	*Stachys arvensis*	Weed	
Malvaceae	*Lagunaria patersonia*	Weed	
Myrtaceae	*Agonis flexuosa*		
Myrtaceae	*Callistemon* sp.	Weed	Sterile, appears planted
Myrtaceae	*Eucalyptus ?conferruminata*		
Myrtaceae	*Eucalyptus cornuta*		
Myrtaceae	*Eucalyptus globulus*	Weed	
Myrtaceae	*Eucalyptus gomphocephala* var. *gomphocephala*		
Myrtaceae	*Eucalyptus petiolaris*	Weed	
Myrtaceae	*Gaudium laevigatum*	Weed	
Myrtaceae	*Lophostemon confertus*	Weed	
Myrtaceae	*Melaleuca rhaphiophylla*		
Myrtaceae	*Metrosideros* sp.	Weed	
Myrtaceae	*Taxandria juniperina*		
Orchidaceae	*Microtis media* subsp. *media*		
Oxalidaceae	*Oxalis pes-caprae*	Weed	
Papaveraceae	*Fumaria muralis* subsp. *muralis*	Weed	
Phytolaccaceae	*Phytolacca octandra*	Weed	
Pittosporaceae	*Billardiera fusiformis*		
Plantaginaceae	*Plantago* sp.	Weed	
Poaceae	*Avena barbata*	Weed	
Poaceae	*Briza maxima*	Weed	
Poaceae	*Briza minor*	Weed	
Poaceae	*Cenchrus clandestinus*	Weed	
Poaceae	*Cortaderia selloana*	Weed	
Poaceae	*Cynodon dactylon*	Weed	
Poaceae	*Lagurus ovatus*	Weed	
Poaceae	*Lolium* sp.	Weed	
Poaceae	*Polypogon monspeliensis*	Weed	
Poaceae	*Stenotaphrum secundatum*	Weed	
Polygonaceae	*Rumex acetosella*	Weed	
Primulaceae	*Lysimachia arvensis*	Weed	
Proteaceae	*Hakea florida*		
Rhamnaceae	*Spyridium globulosum*		
Rosaceae	*Rubus ulmifolius*	Weed	
Rubiaceae	*Coprosma repens*	Weed	
Salicaceae	*Salix babylonica*	Weed	
Solanaceae	*Physalis peruviana*	Weed	

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Family	Taxon	Status	Notes
Solanaceae	*Solanum laciniatum*	Weed	
Solanaceae	*Solanum nigrum*	Weed	
Tamaricaceae	*Tamarix aphylla*	Declared Pest - s22(2)	
Tropaeolaceae	*Tropaeolum majus*	Weed	
Typhaceae	*Typha orientalis*		

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Appendix D Site-Species Matrix

	Taxon	R01	R02	R03	Opp
*	*Centella asiatica*			+	
*	*Lemna minor*				+
*	*Zantedeschia aethiopica*	+		+	
*	*Asparagus asparagoides*				+
*	*Yucca aloifolia*				+
*	*Cirsium vulgare*				+
*	*Cotula coronopifolia*				+
*	*Erigeron bonariensis*				+
*	*Hypochaeris glabra*				+
*	*Sonchus asper*				+
	Lobelia anceps				+
	Chenopodiaceae sp.		+		
	Rhagodia baccata subsp. *baccata*	+			
	Tecticornia ?indica subsp. *bidens*		+		
	Threlkeldia diffusa		+		
*	*Crassula glomerata*		+		
*	Cupressaceae sp.				+
	Ficinia nodosa				+
	Isolepis cernua var. *setiformis*				+
	Isolepis prolifera			+	+
	Lepidosperma gladiatum				+
	Machaerina articulata				+
	Machaerina juncea				+
	Pteridium esculentum	+			
	Hibbertia cuneiformis				+
*	*Euphorbia paralias*		+		+
	Acacia littorea				+
*	*Acacia longifolia* subsp. *longifolia*				+
*	*Dipogon lignosus*				+
*	*Lotus subbiflorus*				+
*	*Psoralea pinnata*				+
*	*Geranium molle*	+			
*	*Pelargonium capitatum*	+	+		+
*	*Watsonia meriana*				+
	Juncus ?kraussii subsp. *australiensis*		+		
*	*Juncus oxycarpus*				+
	Juncus pallidus				+
*	*Stachys arvensis*		+		

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	Taxon	R01	R02	R03	Opp
*	*Lagunaria patersonia*				+
	Agonis flexuosa	+			+
*	*Callistemon* sp.				+
	Eucalyptus ?conferruminata				+
	Eucalyptus cornuta				+
*	*Eucalyptus globulus*	+			
	Eucalyptus gomphocephala var. *gomphocephala*	+			
*	*Eucalyptus petiolaris*			+	
*	*Gaudium laevigatum*		+		+
*	*Lophostemon confertus*				+
	Melaleuca rhaphiophylla			+	+
*	*Metrosideros* sp.				+
	Taxandria juniperina				+
	Microtis media subsp. *media*				+
*	*Oxalis pes-caprae*				+
*	*Fumaria muralis* subsp. *muralis*				+
*	*Phytolacca octandra*				+
	Billardiera fusiformis				+
*	*Plantago* sp.				+
*	*Avena barbata*	+	+		+
*	*Briza maxima*				+
*	*Briza minor*				+
*	*Cenchrus clandestinus*	+			
*	*Cortaderia selloana*				+
*	*Cynodon dactylon*		+		
*	*Lagurus ovatus*		+		+
*	*Lolium* sp.				+
*	*Polypogon monspeliensis*				+
*	*Stenotaphrum secundatum*	+	+		
*	*Rumex acetosella*				+
*	*Lysimachia arvensis*				+
	Hakea florida				+
	Spyridium globulosum				+
*	*Rubus ulmifolius*				+
*	*Coprosma repens*				+
*	*Salix babylonica*				+
*	*Physalis peruviana*				+
*	*Solanum laciniatum*				+
*	*Solanum nigrum*				+
*	*Tamarix aphylla*				+

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	Taxon	R01	R02	R03	Opp
*	*Tropaeolum majus*				+
	Typha sp.				+

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Appendix E Site Data

Project: 65310 **Date:** 2023-10-25

Site: R01 **Coordinates:** -35.025593, 117.859817 **Datum:** GDA94 **Site Type:** Releve

Site Size: 10 x 10 m **Site Marker:** No marker (temporary site) **Photo Location:** Centre

Landform: dune **Aspect:** n/a **Slope:** 0

Outcropping: no **Rock Type:** Nil

Soil Type: **Soil Notes:** Light grey brown sand

Surface: 1% bare ground, 0% outcropping, 2% litter **Years Since Fire:** yrs

Large Trees Present (>500 mm DBH): yes

Condition: Completely Degraded **Disturbance Notes:** Parkland cleared, weeds

Vegetation Description: *Eucalyptus cornuta* and **Eucalyptus globulus* over *Agonis flexuosa* over *Pteridium esculentum*, **Stenotaphrum secundatum*, **Cenchrus clandestinus* and **Pelargonium capitatum*

Taxon	Height (cm)	Cover (%)	Cover (Dead %)	Comment
* *Eucalyptus globulus*	1500	60		
Eucalyptus gomphocephala var. *gomphocephala*	1500	5		
* Cupressaceae sp.	900			Opp coll
Agonis flexuosa	800	20		
Rhagodia baccata subsp. *baccata*	120			Opp coll
Pteridium esculentum	100	3		
* *Cenchrus clandestinus*	100	3		
* *Stenotaphrum secundatum*	100	80		
* *Pelargonium capitatum*	80	5		
* *Avena barbata*	70	0.5		
* *Zantedeschia aethiopica*	25	0.05		
* *Geranium molle*	5	0.001		
Hibbertia cuneiformis				Opp coll
Machaerina juncea				Opp coll
Acacia littorea				Opp coll
Billardiera fusiformis				Opp coll
* *Psoralea pinnata*				Opp coll

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	Hakea florida	Opp coll
	Lepidosperma gladiatum	Opp coll
*	*Briza maxima*	Opp coll
	Ficinia nodosa	Opp coll
*	*Asparagus asparagoides*	Opp coll
	Spyridium globulosum	Opp coll
*	*Briza minor*	Opp coll
*	*Cortaderia selloana*	Opp coll
*	*Metrosideros* sp.	Opp coll
*	*Physalis peruviana*	Opp coll
*	*Leptospermum laevigatum*	Opp coll
*	*Tamarix aphylla*	Opp coll
*	*Euphorbia paralias*	Opp coll
*	*Lagurus ovatus*	Opp coll
*	*Lagunaria patersonia*	Opp coll

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Project: 65310 **Date:** 2023-10-25

Site: R02 **Coordinates:** -35.027226, 117.864242 **Datum:** GDA94 **Site Type:** Releve

Site Size: 10 x 10 m **Site Marker:** No marker (temporary site) **Photo Location:** Centre

Landform: depression/ basin **Aspect:** South-east **Slope:** 5

Outcropping: no **Rock Type:** Laterite breakwater

Soil Type: **Soil Notes:** Loamy mud

Surface: 30% bare ground, 0% outcropping, 5% litter **Years Since Fire:** yrs

Large Trees Present (>500 mm DBH): no

Condition: Degraded **Disturbance Notes:** Weeds

Vegetation Description: *Juncus ?krausii* over *Threlkeldia diffusa* and *Tecticornia ?indica*

	Taxon	Height (cm)	Cover (%)	Cover (Dead %)	Comment
*	*Gaudium laevigatum*	200	1		
	Juncus ?kraussii subsp. *australiensis*	100	20		
*	*Avena barbata*	45	0.1		
	Threlkeldia diffusa	30	5		
*	*Euphorbia paralias*	30	0.5		
*	*Lagurus ovatus*	20	0.01		
*	*Pelargonium capitatum*	20	0.1		
	Tecticornia ?indica subsp. *bidens*	20	30		
*	*Stachys arvensis*	15	0.001		
	Chenopodiaceae sp. (sterile)	15	0.25		
*	*Stenotaphrum secundatum*	10	0.5		
*	*Cynodon dactylon*	5	2		
*	*Crassula glomerata*	3	0.01		
*	*Phytolacca octandra*				Opp coll
*	*Solanum laciniatum*				Opp coll
*	*Rubus ulmifolius*				Opp coll
*	*Lophostemon confertus*				Opp coll
	Eucalyptus ?conferruminata				Opp coll - behind fence
*	*Dipogon lignosus*				Opp coll

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Project: 65310 **Date:** 2023-10-27

Site: R03 **Coordinates:** -35.024270, 117.860263 **Datum:** GDA94 **Site Type:** Releve

Site Size: 10 x 10 m **Site Marker:** No marker (temporary site) **Photo Location:** Centre

Landform: depression/ basin **Aspect:** n/a **Slope:** 0

Outcropping: no **Rock Type:** Nil

Soil Type: **Soil Notes:** Obscured

Surface: 0% bare ground, 0% outcropping, 100% litter **Years Since Fire:** yrs

Large Trees Present (>500 mm DBH): yes

Condition: Very Good **Disturbance Notes:** Weeds

Vegetation Description: *Melaleuca rhaphiophylla* over *Isolepis prolifera, *Zantedeschia aethiopica* and **Centella asiatica*

Taxon		Height (cm)	Cover (%)	Cover (Dead %)	Comment
	Melaleuca rhaphiophylla	800	95		
*	*Zantedeschia aethiopica*	100	0.5		
	Isolepis prolifera	25	5		
*	*Centella asiatica*	20	0.1		
	Taxandria juniperina				Opp coll
*	*Acacia longifolia* subsp. *longifolia*				Opp coll
	Typha sp.				In drain
*	*Tropaeolum majus*				Opp coll
*	*Fumaria muralis* subsp. *Muralis*				Opp coll
*	*Juncus oxycarpus*				Opp coll
*	*Eucalyptus petiolaris*				Opp coll

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Appendix F Fauna Report

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Albany
2023 Fauna Assessment

Prepared by: J. Turpin
Kingfisher Environmental
Mundaring, WA 6073

October 2023

Categories Used in the Assessment of Conservation Status.

IUCN categories as used for the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Biodiversity Conservation Act 2016*.

CATEGORY	DEFINITION
Extinct	Taxa not definitely located in the wild during the past 50 years.
Extinct in the Wild	Taxa known to survive only in captivity.
Critically Endangered	Taxa facing an extremely high risk of extinction in the wild in the immediate future.
Endangered	Taxa facing a very high risk of extinction in the wild in the near future.
Vulnerable	Taxa facing a high risk of extinction in the wild in the medium-term future.
Near Threatened	Taxa that risk becoming Vulnerable in the wild.
Conservation Dependent	Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classed as Vulnerable or more severely threatened.
Data Deficient (Insufficiently Known)	Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.
Least Concern	Taxa that are not Threatened.

Definitions of relevant categories under the EPBC Act 1999.

CATEGORY	DEFINITION
Endangered (EN)	The species is likely to become extinct unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate; or its numbers have been reduced to such a critical level, or its habitats have been so drastically reduced, that it is in immediate danger of extinction.
Vulnerable (VU)	Within the next 25 years, the species is likely to become endangered unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate.
Migratory (M)	Species are defined as migratory if they are listed in an international agreement approved by the Commonwealth Environment Minister, including: • the Bonn Convention ((Convention on the Conservation of Migratory Species of Wild Animals) for which Australia is a range state;

	• The Agreement between the Government of Australia and the Government of the Peoples Republic of China for the Protection of Migratory Birds and their Environment (CAMBA); or • The Agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA).

Categories used in the Biodiversity Conservation Act 2016.

CATEGORY	DEFINITION
Critically Endangered	Facing an extremely high risk of extinction in the wild in the immediate future.
Endangered	Facing a very high risk of extinction in the wild in the near future.
Vulnerable	Facing a high risk of extinction in the wild in the medium-term future.
Extinct	There is no reasonable doubt that the last individual has died. A species is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the species' life cycle and life form.
Extinct in the wild	It is known only to survive in cultivation, in captivity or as a naturalised population (or populations) well outside the past range. A species is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the species' life cycle and life form
Special Conservation Interest	It is of special conservation interest because it - (i) has a naturally low population range; or (ii) has a restricted natural range; or (iii) is subject to or recovering from a significant population decline or reduction in natural range Conservation dependent species – that is species that have previously been listed as threatened, but have recovered to the extent that they no longer meet the criteria for threatened, and the species is dependent on conservation actions continuing, i.e. the species is the focus of a specific conservation programme, the cessation of which would result in it again becoming eligible for listing as a threatened species within a period.
Migratory	A native species is eligible for listing in the category of migratory if: (i) Members of the species periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or (ii) the species is the subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth. International agreements that apply to the listing of a species as a migratory species are: Japan - Australia Migratory Birds Agreement (JAMBA); China - Australia Migratory Birds Agreement (CAMBA); Republic of Korea - Australia Migratory Birds Agreement (ROKAMBA); and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn).
Species otherwise in need of special protection	A species that is otherwise in need of special protection if it does not meet any of the above criteria, but is a species for which a need for special protection exists.

Department of Biodiversity, Conservation and Attractions Priority Fauna Species (species not listed under the BC Act, but for which there is some concern).

CATEGORY	DEFINITION
Priority One (P1)	Poorlyknown species. Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g., agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
Priority Two (P2)	Poorly known species. Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g., national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
Priority Three (P3)	Poorly known species. Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
Priority Four (P4)	Rare, Near Threatened and other species in need of monitoring: (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for Vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Fauna recorded during the assessment.

73 species recorded, including 66 from within the project area during the assessment on the 25th and 26th October 2023. Three cameras set 25th and collected 28th October and bird surveys conducted throughout and on adjacent mudflats, over two consecutive mornings and afternoons. Targeted searching for sign of significant fauna was conducted throughout, and also when the Western Ringtail Possum was identified, a wider transect was searched to identify the species presence.

Fauna Recorded (X) from the Survey Area (Tables 1 to 4).

TABLE 1. Frogs recorded during the survey

Common Name	Species Name	Status	Survey Area
PELODRYADIDAE			
Slender Tree Frog	*Litoria adelaidensis*		X
Motorbike Frog	*Litoria moorei*		X
MYOBATRACHIDAE			
Rattling Froglet	*Crinia glauerti*		X
Total Number of Species: 3			**3**

TABLE 2. Reptiles recorded during the survey

Common Name	Species Name	Status	Survey Area
SCINCIDAE			
King's Skink	*Egernia kingii*		X
Total Number of Species: 1			1

TABLE 3. Birds recorded during the survey

Common Name	Species Name	Status	Survey Area
ANATIDAE			
Australian Wood Duck	*Chenonetta jubata*		X
Pacific Black Duck	*Anas superciliosa*		X
Chestnut Teal	*Anas castanea*		X
ANHINGIDAE			
Darter	*Anhinga melanogaster*		
COLUMBIDAE			
Common Bronzewing	*Phaps chalcoptera*		X
Feral Pigeon	*Columba livia*		X
ARDEIDAE			
White-faced Heron	*Egretta novaehollandiae*		X
Eastern Great Egret	*Ardea alba*	M	
PHALACROCORACIDAE			
Little Pied Cormorant	*Phalacrocorax melanoleucos*		
Pied Cormorant	*Phalacrocorax varius*		
Little Black Cormorant	*Phalacrocorax sulcirostris*		
Great Cormorant	*Phalacrocorax carbo*		
PELECANIDAE			
Australian Pelican	*Pelecanus conspicillatus*		
Threskiornithidae			
Australian White Ibis	*Threskiornis moluuca*		X
Yellow-billed Spoonbill	*Platalea flavipes*		
ACCIPITRIDAE			
Eastern Osprey	*Pandion haliaetus*	M	X
Whistling Kite	*Haliastur sphenurus*		X
Swamp Harrier	*Circus approximans*		X
RALLIDAE			
Purple Swamphen	*Porphyrio porphyrio*		X
HAEMATOPODIDAE			
Pied Oystercatcher	*Haematopus longirostris*		X
CHARADRIIDAE			
Red-capped Plover	*Charadrius ruficapillus*		X
Grey Plover	*Pluvialis squatarola*	M	
SCOLOPACIDAE			
Red-necked Stint	*Calidris ruficollis*	M	X
Common Sandpiper	*Actitis hypoleucos*	M	
LARIDAE			
Silver Gull	*Larus novaehollandiae*		X

Common Name	Species Name	Status	Survey Area
Pacific Gull	*Larus pacificus*	Ma	
Caspian Tern	*Hydroprogne caspia*	IA	
Crested Tern	*Thalasseus bergii*	MI	
Fairy Tern	*Sternula nereis*	V	
CACATUIDAE			
Galah	*Eolophusroseicapillus*		X
Red-tailed Black-Cockatoo	*Calyptorhynchus banksii*	V	
PSITTACIDAE			
Purple-crowned Lorikeet	*Glossopsitta porphyrocephala*		X
Australian Ringneck	*Barnardius zonarius*		X
Red-capped Parrot	*Purpureicephalus spurius*		X
Western Rosella	*Platycercus icterotis*		X
CUCULIDAE			
Shining Bronze Cuckoo	*Chalcites lucidus*		X
Fan-Tailed Cuckoo	*Cacomantis flabelliformis*		X
MALURIDAE			
Splendid Fairy-wren	*Malurus splendens*		X
Red-winged Fairywren	*Malurus elegans*		X
Southern Emu-wren	*Stipiturus malachurus*		X
ACANTHIZIDAE			
Weebill	*Smicrornis brevirostris*		X
Spotted Scrubwren	*Sericornis maculatus*		X
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*		X
PARDALOTIDAE			
Spotted Pardalote	*Pardalotus punctatus*		X
MELIPHAGIDAE			
Singing Honeyeater	*Gavicalis virescens*		X
Red Wattlebird	*Anthochaera carunculata*		X
Brown Honeyeater	*Lichmera indistincta*		X
New Holland Honeyeater	*Phylidonyris novaehollandiae*		X
CAMPEPHAGIDAE			
Black-faced Cuckoo-shrike	*Coracinanovaehollandiae*		X
PACHYCEPHALIDAE			
Golden Whistler	*Pachycephala pectoralis*		X
Grey Shrike-thrush	*Colluricincla harmonica*		X
ARTAMIDAE			
Grey Butcherbird	*Cracticustorquatus*		X
Australian Magpie	*Cracticustibicen*		X

Common Name	Species Name	Status	Survey Area
RHIPIDURIDAE			
Grey Fantail	*Rhipidura albiscapa*		X
Willie Wagtail	*Rhipidura leucophrys*		X
CORVIDAE			
Australian Raven	*Corvus coronoides*		X
MONARCHIDAE			
Magpie-lark	*Grallina cyanoleuca*		X
MEGALURIDAE			
Little Grassbird	*Poodytes gramineus*		
HIRUNDINIDAE			
Welcome Swallow	*Hirundo neoxena*		X
Fairy Martin	*Petrochelidon ariel*		X
ESTRILDIDAE			
Red-eared Firetail	*Stagonopleura oculata*		X
ZOSTEROPIDAE			
Silvereye	*Zosterops lateralis*		X
Total Number of Species: 62		10	55

TABLE 4. Mammals recorded during the survey

Common Name	Species Name	Status	Survey Area
PERAMELIDAE			
Quenda, Southern Brown Bandicoot	*Isoodon obesulus*	P4	X
PSEUDOCHEIRIDAE			
Western Ringtail Possum	*Pseudocheirus occidentalis*	CE	X
MACROPODIDAE			
Western Grey Kangaroo	*Macropus fuliginosus*		X
INTRODUCED MAMMALS			
Dog	*Canis lupus*		X
Feral Cat	*Felis catus*		X
Rabbit	*Oryctolagus cuniculus*		X
Black Rat	*Rattus rattus*		X
Total Number of Native Species: 3		**2**	**3**
Total Number of Introduced Species: 4			**4**

Details of Survey Methodology

Location of Motion-activated Cameras installed during the survey

Camera Name	Datum	Latitude	Longitude	Habitat
1	GDA2020	-35.0243271	117.8619259	Densely vegetated drainage
2	GDA2020	-35.0251351	117.8608117	Peppermint thicket
3	GDA2020	-35.0265703	117.8599226	Peppermint thicket

Species recorded on camera

Common Name	Species Name	Status	Cameras
King's Skink	*Egernia kingie*		3
Quenda	*Isoodon obesulus*		1
Black Rat	*Rattus rattus*		2
Feral Cat	*Felis catus*		1
Rabbit	*Oryctolagus cuniculus*		1

Locations of Conservation Significant Fauna

Table 1. Species of Conservation Significance Recorded

Species	Status	latitude	longitude	Comments
Fairy Tern	V	-35.0303653	117.8581854	Four birds seen foraging
Great Egret	MA	-35.0298255	117.8554567	1 bird seen foraging
Caspian Tern	IA	-35.0277998	117.8622792	2 birds seen
Greater Crested Tern (Crested	MI	-35.0310682	117.8546606	2 birds seen
Common Sandpiper	IA	-35.0273543	117.864434	1 bird seen
Common Sandpiper	IA	-35.0274499	117.863672	1 bird seen
Grey Plover	IA	-35.0303653	117.8581854	1 bird seen
Grey Plover	IA	-35.0277575	117.8623883	2 birds seen
Grey Plover	IA	-35.0284805	117.8598714	2 birds seen
Red-necked Stint	IA	-35.0277831	117.8583951	65 birds seen foraging
Red-necked Stint	IA	-35.0271031	117.8589219	43 birds seen foraging
Red-necked Stint	IA	-35.0274163	117.8623124	24 birds seen foraging
Red-necked Stint	IA	-35.027521	117.8607744	24 birds seen foraging
Red-necked Stint	IA	-35.0310682	117.8546606	90 birds seen foraging
Red-necked Stint	IA	-35.0269708	117.8595234	12 birds seen foraging
Eastern Osprey	M	-35.0275286	117.8580417	1 birds seen foraging
Western Ringtail Possum	CE	-35.0265703	117.8599226	5 Dreys seen in one tree
Western Ringtail Possum	CE	-35.0255424	117.8639863	Drey in tree
Western Ringtail Possum	CE	-35.029568	117.8546286	Drey in tree
Western Ringtail Possum	CE	-35.0354676	117.8497851	Drey in tree
Western Ringtail Possum	CE	-35.029992	117.8537088	Drey in tree
Western Ringtail Possum	CE	-35.0293693	117.8551888	Drey x 2 in tree
Western Ringtail Possum	CE	-35.0300893	117.8533328	Drey in tree
Western Ringtail Possum	CE	-35.0319361	117.8515157	Scat
Western Ringtail Possum	CE	-35.0264899	117.8594427	Scat
Western Ringtail Possum	CE	-35.0258597	117.8598088	Scat
Western Ringtail Possum	CE	-35.0263057	117.8640448	Scat
Western Ringtail Possum	CE	-35.0274053	117.861443	Scat
Western Ringtail Possum	CE	-35.027406	117.8619878	Scat
Western Ringtail Possum	CE	-35.0275575	117.8621045	Scat
Western Ringtail Possum	CE	-35.0272934	117.8599411	Scat
Western Ringtail Possum	CE	-35.0273965	117.8600244	Scat
Western Ringtail Possum	CE	-35.0274872	117.8601975	Scat
Western Ringtail Possum	CE	-35.0273926	117.8603149	Scat
Western Ringtail Possum	CE	-35.0274287	117.8604358	Scat
Western Ringtail Possum	CE	-35.0273755	117.8614482	Scat
Western Ringtail Possum	CE	-35.0247213	117.862659	Scat
Western Ringtail Possum	CE	-35.0248351	117.861119	Scat
Western Ringtail Possum	CE	-35.0252257	117.8605794	Scat
Western Ringtail Possum	CE	-35.0251351	117.8608117	Scat
Western Ringtail Possum	CE	-35.0251565	117.860755	Scat
Western Ringtail Possum	CE	-35.0251282	117.8608611	Scat
Western Ringtail Possum	CE	-35.0248763	117.8612651	Scat
Western Ringtail Possum	CE	-35.0248132	117.8612014	Scat
Quenda	P4	-35.0264899	117.8594427	Scat
Quenda	P4	-35.0236365	117.861398	Dig
Quenda	P4	-35.0247977	117.8625677	Dig
Quenda	P4	-35.0252001	117.8606372	Dig
Quenda	P4	-35.0243271	117.8619259	One observed
Red-tailed Black Cockatoo	V	-35.026393	117.865626	Heard adjacent

Note: status refers to conservation status

Broad Fauna habitats recorded during the assessment.

Landform	Vegetation	Inside survey area	Comments
Mudflats and shoreline	None	Intertidal area	Wader habitat
Freshwater and Brackish Wetlands	Reeds / Sedges and fringing riparian	Yes	Waterbirds and frogs, Chestnut Teal breeding
Drainage line	Yate and Peppermint thickets over sedges and mixed shrubs	Yes	Habitat for Western Ringtail Possum and Quenda
Damplands	Melaleuca preissiana and Peppermint Woodland	Yes	Habitat for Western Ringtail Possum and Quenda
Damplands	Mixed native and introduced species	Yes	Quenda occur
Disturbed	Pasture, introduced weeds and native speces	Yes	Quenda occur

Notes:

The mudflats appear important for waders with close to 100 Red-necked Stints recorded adjacent to the survey area. Greater Sand Plover, Red Knot, Ruddy Turnstone, Pacific Golden Plover, Bar-tailed Godwit and Great Knot all recorded nearby within 5 km (Little Grove-Rushy Point) during September and October 2023 – see EBird. This area has mudflat connectivity with the project – see satellite imagery.

Appendix G PMST Search

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Australian Government

Department of Climate Change, Energy, the Environment and Water

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 27-Jun-2024

Summary

Details

- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat

Acknowledgements

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	75
Listed Migratory Species:	64

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	16
Commonwealth Heritage Places:	None
Listed Marine Species:	91
Whales and Other Cetaceans:	14
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	20
Regional Forest Agreements:	None
Nationally Important Wetlands:	1
EPBC Act Referrals:	27
Key Ecological Features (Marine):	None
Biologically Important Areas:	9
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name	Buffer Status
Commonwealth Marine Areas (EPBC Act)	In buffer area only

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Empodisma peatlands of southwestern Australia	Endangered	Community likely to occur within area	In feature area
Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia	Endangered	Community may occur within area	In buffer area only
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area	In buffer area only

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Aphelocephala leucopsis			
Southern Whiteface [529]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Ardenna grisea			
Sooty Shearwater [82651]	Vulnerable	Species or species habitat may occur within area	In feature area
Arenaria interpres			
Ruddy Turnstone [872]	Vulnerable	Roosting known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Roosting known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris tenuirostris Great Knot [862]	Vulnerable	Roosting known to occur within area	In feature area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area	In feature area
Cereopsis novaehollandiae grisea Cape Barren Goose (south-western), Recherche Cape Barren Goose [25978]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area	In feature area
Dasyornis longirostris Western Bristlebird [515]	Endangered	Species or species habitat likely to occur within area	In feature area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Endangered	Species or species habitat known to occur within area	In feature area
Limosa limosa Black-tailed Godwit [845]	Endangered	Roosting known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Phaethon rubricauda westralis](#) Red-tailed Tropicbird (Indian Ocean), Indian Ocean Red-tailed Tropicbird [91824]	Endangered	Species or species habitat may occur within area	In feature area
[Phoebetria fusca](#) Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
[Pluvialis squatarola](#) Grey Plover [865]	Vulnerable	Roosting known to occur within area	In feature area
[Psophodes nigrogularis nigrogularis](#) Western Heath Whipbird [64449]	Endangered	Species or species habitat likely to occur within area	In buffer area only
[Pterodroma mollis](#) Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Sternula nereis nereis](#) Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
[Thalassarche carteri](#) Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Thalassarche cauta](#) Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
[Thalassarche impavida](#) Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
[Thalassarche melanophris](#) Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
[Thalassarche steadi](#) White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Tringa nebularia](#)			
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area	In feature area
[Xenus cinereus](#)			
Terek Sandpiper [59300]	Vulnerable	Roosting known to occur within area	In feature area
[Zanda baudinii listed as Calyptorhynchus baudinii](#)			
Baudin's Cockatoo, Baudin's Black-Cockatoo, Long-billed Black-cockatoo [87736]	Endangered	Breeding known to occur within area	In feature area
[Zanda latirostris listed as Calyptorhynchus latirostris](#)			
Carnaby's Black Cockatoo, Short-billed Black-cockatoo [87737]	Endangered	Breeding known to occur within area	In feature area
FISH			
[Nannatherina balstoni](#)			
Balston's Pygmy Perch [66698]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
[Thunnus maccoyii](#)			
Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat known to occur within area	In feature area
INSECT			
[Trioza barrettae](#)			
Banksia brownii plant louse [87805]	Endangered	Species or species habitat known to occur within area	In feature area
MAMMAL			
[Balaenoptera borealis](#)			
Sei Whale [34]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Balaenoptera musculus](#)			
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In feature area
[Balaenoptera physalus](#)			
Fin Whale [37]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Dasyurus geoffroii](#)			
Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Eubalaena australis](#) Southern Right Whale [40]	Endangered	Breeding known to occur within area	In feature area
[Neophoca cinerea](#) Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat may occur within area	In feature area
[Parantechinus apicalis](#) Dibbler [313]	Endangered	Species or species habitat known to occur within area	In feature area
[Pseudocheirus occidentalis](#) Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat known to occur within area	In feature area
OTHER			
[Westralunio carteri](#) Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
PLANT			
[Banksia brownii](#) Brown's Banksia, Feather-leaved Banksia [8277]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Banksia goodii](#) Good's Banksia [16727]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
[Banksia verticillata](#) Granite Banksia, Albany Banksia, River Banksia [8333]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Caladenia granitora](#) [65292]	Endangered	Species or species habitat may occur within area	In feature area
[Caladenia harringtoniae](#) Harrington's Spider-orchid, Pink Spider-orchid [56786]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Calectasia cyanea](#) Blue Tinsel Lily [7669]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Chordifex abortivus Manypeaks Rush [64868]	Endangered	Species or species habitat known to occur within area	In feature area
Conostylis misera Grass Conostylis [21320]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Diuris drummondii Tall Donkey Orchid [4365]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat known to occur within area	In feature area
Isopogon uncinatus Albany Cone Bush, Hook-leaf Isopogon [20871]	Endangered	Species or species habitat known to occur within area	In feature area
Kennedia glabrata Northcliffe Kennedia [16452]	Vulnerable	Species or species habitat may occur within area	In feature area
Microtis globula South-Coast Mignonette Orchid [6780]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Sphenotoma drummondii Mountain Paper-heath [21160]	Endangered	Species or species habitat may occur within area	In feature area
Verticordia fimbrilepis subsp. australis Southern Shy Featherflower [24630]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
REPTILE			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area	In feature area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Dermochelys coriacea			
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area
SHARK			
Carcharias taurus (west coast population)			
Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Carcharodon carcharias			
White Shark, Great White Shark [64470]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Galeorhinus galeus			
School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark [68453]	Conservation Dependent	Species or species habitat may occur within area	In buffer area only
Rhincodon typus			
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area

Listed Migratory Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Ardenna carneipes			
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Breeding known to occur within area	In feature area
Ardenna grisea			
Sooty Shearwater [82651]	Vulnerable	Species or species habitat may occur within area	In feature area
Diomedea antipodensis			
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea dabbenena			
Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In feature area
Hydroprogne caspia Caspian Tern [808]		Breeding known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Onychoprion anaethetus Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Thalassarche melanophris](#) Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
[Thalassarche steadi](#) White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In feature area
Migratory Marine Species			
[Balaenoptera borealis](#) Sei Whale [34]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Balaenoptera edeni](#) Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
[Balaenoptera musculus](#) Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In feature area
[Balaenoptera physalus](#) Fin Whale [37]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Caperea marginata](#) Pygmy Right Whale [39]		Species or species habitat may occur within area	In feature area
[Carcharhinus longimanus](#) Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area	In feature area
[Carcharodon carcharias](#) White Shark, Great White Shark [64470]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area	In feature area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Dermochelys coriacea			
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area
Eubalaena australis as Balaena glacialis australis			
Southern Right Whale [40]	Endangered	Breeding known to occur within area	In feature area
Lagenorhynchus obscurus			
Dusky Dolphin [43]		Species or species habitat may occur within area	In feature area
Lamna nasus			
Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area	In feature area
Megaptera novaeangliae			
Humpback Whale [38]		Species or species habitat known to occur within area	In feature area
Mobula alfredi as Manta alfredi			
Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat known to occur within area	In feature area
Mobula birostris as Manta birostris			
Giant Manta Ray [90034]		Species or species habitat known to occur within area	In feature area
Orcinus orca			
Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area
Rhincodon typus			
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area
Migratory Terrestrial Species			
Motacilla cinerea			
Grey Wagtail [642]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Arenaria interpres](#) Ruddy Turnstone [872]	Vulnerable	Roosting known to occur within area	In feature area
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]	Vulnerable	Roosting known to occur within area	In feature area
[Calidris alba](#) Sanderling [875]		Roosting known to occur within area	In feature area
[Calidris canutus](#) Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat known to occur within area	In feature area
[Calidris ruficollis](#) Red-necked Stint [860]		Roosting known to occur within area	In feature area
[Calidris tenuirostris](#) Great Knot [862]	Vulnerable	Roosting known to occur within area	In feature area
[Charadrius bicinctus](#) Double-banded Plover [895]		Roosting known to occur within area	In feature area
[Charadrius leschenaultii](#) Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Charadrius mongolus](#) Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area	In feature area
[Gallinago megala](#) Swinhoe's Snipe [864]		Roosting likely to occur within area	In buffer area only
[Gallinago stenura](#) Pin-tailed Snipe [841]		Roosting likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
Limosa limosa Black-tailed Godwit [845]	Endangered	Roosting known to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area	In buffer area only
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area	In feature area
Pandion haliaetus Osprey [952]		Breeding known to occur within area	In feature area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area	In feature area
Pluvialis squatarola Grey Plover [865]	Vulnerable	Roosting known to occur within area	In feature area
Thalasseus bergii Greater Crested Tern [83000]		Breeding known to occur within area	In buffer area only
Tringa brevipes Grey-tailed Tattler [851]		Roosting known to occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area	In feature area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area	In feature area
Xenus cinereus Terek Sandpiper [59300]	Vulnerable	Roosting known to occur within area	In feature area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Defence		
Defence - ALBANY TRAINING DEPOT [50137]	WA	In buffer area only
Defence - ALBANY TRAINING DEPOT [50136]	WA	In buffer area only
Defence - ALBANY TRAINING DEPOT ; AIRTC ALBANY [50116]	WA	In buffer area only
Defence - ALBANY TRAINING DEPOT ; AIRTC ALBANY [50115]	WA	In buffer area only
Unknown		
Commonwealth Land - [51033]	WA	In buffer area only
Commonwealth Land - [51034]	WA	In buffer area only
Commonwealth Land - [51035]	WA	In buffer area only
Commonwealth Land - [51036]	WA	In buffer area only
Commonwealth Land - [51038]	WA	In buffer area only
Commonwealth Land - [51398]	WA	In buffer area only
Commonwealth Land - [51017]	WA	In buffer area only
Commonwealth Land - [52149]	WA	In buffer area only
Commonwealth Land - [51399]	WA	In buffer area only
Commonwealth Land - [51032]	WA	In buffer area only
Commonwealth Land - [50308]	WA	In buffer area only
Commonwealth Land - [51030]	WA	In buffer area only

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Breeding known to occur within area	In feature area
Ardenna grisea as Puffinus griseus Sooty Shearwater [82651]	Vulnerable	Species or species habitat may occur within area	In feature area
Arenaria interpres Ruddy Turnstone [872]	Vulnerable	Roosting known to occur within area	In feature area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Roosting known to occur within area	In feature area
Calidris alba Sanderling [875]		Roosting known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area overfly marine area	In feature area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris tenuirostris Great Knot [862]	Vulnerable	Roosting known to occur within area overfly marine area	In feature area
Cereopsis novaehollandiae grisea Cape Barren Goose (south-western), Recherche Cape Barren Goose [25978]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area	In buffer area only
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area overfly marine area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area	In feature area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area overfly marine area	In feature area
Chroicocephalus novaehollandiae as Larus novaehollandiae Silver Gull [82326]		Breeding known to occur within area	In buffer area only
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area	In feature area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In feature area
Eudyptula minor Little Penguin [1085]		Breeding known to occur within area	In buffer area only
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area overfly marine area	In buffer area only
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area overfly marine area	In buffer area only
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area overfly marine area	In feature area
Hydroprogne caspia as Sterna caspia Caspian Tern [808]		Breeding known to occur within area	In feature area
Larus pacificus Pacific Gull [811]		Breeding known to occur within area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
Limosa limosa Black-tailed Godwit [845]	Endangered	Roosting known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area overfly marine area	In buffer area only
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area	In feature area
Onychoprion anaethetus as Sterna anaethetus Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area	In feature area
Pandion haliaetus Osprey [952]		Breeding known to occur within area	In feature area
Pelagodroma marina White-faced Storm-Petrel [1016]		Breeding known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area	In feature area
Pluvialis squatarola Grey Plover [865]	Vulnerable	Roosting known to occur within area overfly marine area	In feature area
Pterodroma macroptera Great-winged Petrel [1035]		Breeding known to occur within area	In buffer area only
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Puffinus assimilis Little Shearwater [59363]		Breeding known to occur within area	In buffer area only
Recurvirostra novaehollandiae Red-necked Avocet [871]		Roosting known to occur within area overfly marine area	In feature area
Stercorarius antarcticus as Catharacta skua Brown Skua [85039]		Species or species habitat may occur within area	In buffer area only
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalasseus bergii as Sterna bergii Greater Crested Tern [83000]		Breeding known to occur within area	In buffer area only
Thinornis cucullatus as Thinornis rubricollis Hooded Plover, Hooded Dotterel [87735]		Species or species habitat known to occur within area overfly marine area	In feature area
Tringa brevipes as Heteroscelus brevipes Grey-tailed Tattler [851]		Roosting known to occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area overfly marine area	In feature area
Xenus cinereus Terek Sandpiper [59300]	Vulnerable	Roosting known to occur within area overfly marine area	In feature area
Fish			
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area	In feature area
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area	In feature area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area	In feature area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area	In feature area
Leptoichthys fistularius Brushtail Pipefish [66248]		Species or species habitat may occur within area	In feature area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area	In feature area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area	In feature area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area	In feature area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area	In feature area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area	In feature area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area	In feature area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area	In feature area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area	In feature area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area	In feature area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area	In feature area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area	In feature area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area	In feature area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area	In feature area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area	In feature area
Mammal			
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Breeding known to occur within area	In feature area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat may occur within area	In feature area
Reptile			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area	In feature area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area

Whales and Other Cetaceans [Resource Information]

Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area	In feature area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In feature area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area	In feature area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In feature area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area	In feature area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In feature area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area	In feature area

Current Scientific Name	Status	Type of Presence	Buffer Status
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area	In feature area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In feature area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In feature area

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Bakers Junction	Nature Reserve	WA	In buffer area only
Bon Accord Road	Nature Reserve	WA	In buffer area only
Down Road	Nature Reserve	WA	In buffer area only
Eclipse Island	Nature Reserve	WA	In buffer area only
Gledhow	Nature Reserve	WA	In buffer area only
Green Island	Nature Reserve	WA	In buffer area only
Gull Rock	National Park	WA	In buffer area only
Lake Powell	Nature Reserve	WA	In buffer area only
Marbelup	Nature Reserve	WA	In buffer area only
Mill Brook	Nature Reserve	WA	In buffer area only
Mistaken Island	Nature Reserve	WA	In buffer area only
Mount Mason	Nature Reserve	WA	In buffer area only
Seal Island (WA32199)	Nature Reserve	WA	In buffer area only
Torndirrup	National Park	WA	In buffer area only
Unnamed WA23088	Conservation Park	WA	In buffer area only

Protected Area Name	Reserve Type	State	Buffer Status
Unnamed WA23923	Nature Reserve	WA	In buffer area only
Unnamed WA32478	5(1)(h) Reserve	WA	In buffer area only
Unnamed WA33308	5(1)(h) Reserve	WA	In buffer area only
Voyagers Park	5(1)(h) Reserve	WA	In buffer area only
West Mount Mason	Nature Reserve	WA	In buffer area only

Nationally Important Wetlands

[Resource Information]

Wetland Name	State	Buffer Status
Oyster Harbour	WA	In buffer area only

EPBC Act Referrals

[Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Sydney Street Subdivision	2023/09530		Completed	In buffer area only
Controlled action				
Albany Heritage Park Link Trail, WA	2019/8480	Controlled Action	Assessment Approach	In buffer area only
Albany Heritage Park Trail Network Concept Plan	2017/7943	Controlled Action	Completed	In buffer area only
Albany Port Authority dredging project	2006/2540	Controlled Action	Post-Approval	In buffer area only
Albany Ring Road Stages 2 and 3B, WA	2020/8769	Controlled Action	Post-Approval	In feature area
Bayonet Head Residential Development, Albany, WA	2015/7624	Controlled Action	Further Information Request	In buffer area only
Emu Point Residential Area Project	2010/5479	Controlled Action	Completed	In buffer area only
Southdown Magnetite Mine	2006/2544	Controlled Action	Completed	In feature area
Not controlled action				
Albany Motorsport Park, 20kms Northwest Albany, WA	2021/8944	Not Controlled Action	Completed	In buffer area only
Albany Port Maintenance Dredging, Albany, WA	2014/7246	Not Controlled Action	Completed	In buffer area only
Anzac Centre Develpment, Albany, WA	2012/6571	Not Controlled Action	Completed	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Anzac Interpretive Centre Development, Albany, WA	2013/6903	Not Controlled Action	Completed	In buffer area only
Development of Grasmere Wind Farm	2008/4368	Not Controlled Action	Completed	In buffer area only
Engineered Strand Lumber Plant	2007/3421	Not Controlled Action	Completed	In buffer area only
Eradication of the European House Borer, Perth metropolitan area, WA	2009/5027	Not Controlled Action	Completed	In buffer area only
Firebreak Creation, Kalgan, WA	2020/8681	Not Controlled Action	Completed	In buffer area only
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
Mount Barker to Albany Water Supply Pipeline	2013/6720	Not Controlled Action	Completed	In buffer area only
Prescribed burn of Cells 5, 6 & 8 of Crown Land Reserve 35381, Napier, WA	2013/6798	Not Controlled Action	Completed	In buffer area only
Protected Harbour Development	2006/3091	Not Controlled Action	Completed	In buffer area only
Scuttling of the HMAS Perth	2001/171	Not Controlled Action	Completed	In buffer area only
Seismic Survey, Bremer Basin, Mentelle Basin and Zeewyck Sub-basin	2004/1700	Not Controlled Action	Completed	In feature area
South Coast Highway Widening 8.2-14.16 SLK	2017/8009	Not Controlled Action	Completed	In buffer area only
Sth Coast Hwy Road Widening, Albany, WA	2018/8279	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Referral decision				
Albany Port Maintenance Dredging	2010/5527	Referral Decision	Completed	In buffer area only

Biologically Important Areas			[Resource Information]
Scientific Name	Behaviour	Presence	Buffer Status
Seabirds			
Ardenna carneipes Flesh-footed Shearwater [82404]	Foraging (in high numbers)	Known to occur	In buffer area only
Eudyptula minor Little Penguin [1085]	Foraging (provisioning young)	Known to occur	In feature area
Hydroprogne caspia Caspian Tern [808]	Foraging (provisioning young)	Known to occur	In feature area
Larus pacificus Pacific Gull [811]	Foraging (in high numbers)	Known to occur	In buffer area only
Onychoprion anaethetus Bridled Tern [82845]	Foraging (in high numbers)	Known to occur	In buffer area only
Puffinus assimilis tunneyi Little Shearwater [59363]	Foraging (in high numbers)	Known to occur	In buffer area only
Sternula nereis Fairy Tern [82949]	Foraging (in high numbers)	Known to occur	In buffer area only
Sharks			
Carcharodon carcharias White Shark [64470]	Foraging	Known to occur	In feature area
Whales			
Megaptera novaeangliae Humpback Whale [38]	Migration (north)	Known to occur	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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63996/150,878

M01 Albany Woolstores Preliminary Ecological Assessment

17 March 2023

Mr Andrew Cumming

Mainbeam Holdings Pty Ltd/Rowe Group

Level 3, 369 Newcastle Street

Northbridge, WA 6003

Via email: andrew.cumming@rowegroup.com.au

Albany Woolstores Preliminary Ecological Assessment

Dear Andrew,

Mainbeam Pty Ltd (Mainbeam) are preparing a Local Structure Plan (LSP) over nine lots on Woolstores Place, Mount Elphinstone, located within the City of Albany. The LSP area ("the site") includes Mainbeam landholdings, as well as other State, Commonwealth, and privately owned land, and is depicted in Attachment A. The Proposed Development's focus will primarily be on the future use and development of the Mainbeam landholdings, exploring a mixture of tourist and quality medium to high density residential, with non-residential commercial land uses considered in close proximity to the rail corridor and future road interchange.

The site is located approximately 3.5 km west of the Albany Central Business District and covers a land area of 19.66 ha within the area bound by Frenchman Bay Road, the Princess Royal Harbour waterfront, and the Princess Royal Drive.

In order to support the LSP preparation and lodgement with the City of Albany, Mainbeam commissioned a preliminary ecological assessment by a member of the JBS&G ecology team to undertake the following work to inform structure planning:

- confirm the presence/absence of the coastal samphire threatened ecological community identified in the desktop; and
- clarify the likelihood of occurrence of other key flora and vegetation values identified within the desktop assessment.

The preliminary ecological assessment was undertaken on 15 December 2022 by an Associate Ecologist with over 15 years of experience conducting ecological assessment in the South-west bioregion. A site walkover was carried out to visually inspect key features of the site, with a focus on identifying requirements for further ecological survey and any vegetation potentially representative of the *Subtropical and Temperate Coastal Saltmarsh* ecological community, which is listed as a Priority 3 priority ecological community (PEC) within Western Australia, and a 'Vulnerable' threatened ecological community (TEC) nationally under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The mapped extent of this TEC/PEC and its associated buffers was previously identified during desktop assessment as overlying the site.

Inspection of the site was carried out via on-foot traverses of the site and adjacent lands where access was permitted and could be safely achieved. Several portions of the LSP site could not be thoroughly inspected

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due to boundary obstruction (both temporary and permanent structures) or for safety reasons where demolition works were in progress, building debris and rubble were present, or conditions were otherwise hazardous, however the majority of the site allowed for general visual overview. A visual inspection of existing lots 52, 53 and 54 from outside the northern and southern boundaries was also made, to see if any indicative information on broad vegetation units present could be gleaned.

The *Subtropical and Temperate Coastal Saltmarsh* TEC/PEC occurs in coastal areas under regular or intermittent tidal influence. In southern latitudes saltmarsh is often the main vegetation-type in the intertidal zone, consisting mainly of salt-tolerant vegetation (halophytes) including grasses, herbs, sedges, rushes and shrubs, and it commonly occurs in association with estuaries (DSEWPaC 2013). The TEC/PEC is mainly associated with sandy or muddy shores of estuaries and embayments and on some open, low wave energy coasts. It is characterised by some form of tidal connection and inundation, with most areas draining fully on the ebb tide, but intermittently or rarely-inundated supratidal areas may be incorporated.

Saltmarsh vegetation aligning with key criteria of the *Subtropical and Temperate Coastal Saltmarsh* TEC/PEC was observed adjacent to, but outside of, the LSP during the preliminary ecological inspection, on lower-lying coastal shores to the south-southwest and southeast of the site.

No areas of vegetation clearly identifiable as saltmarsh or considered likely to represent the *Subtropical and Temperate Coastal Saltmarsh* TEC/PEC were observed within the LSP boundary during the inspection visit. One small area of low-lying vegetation in the eastern-most portion of the LSP, adjacent to the rail corridor and north-east of existing lot 402 (Attachment A), exhibited superficial signs of periodic inundation and some lesser-defined features characteristic of saltmarsh vegetation and as such has some potential to constitute the TEC/PEC or an ecotone thereof. More detailed inspection of this portion of vegetation will be necessary in order to accurately characterise it with respect to the *Subtropical and Temperate Coastal Saltmarsh* TEC/PEC inclusion criteria.

Other areas of vegetation within the LSP boundary were not found to overtly exhibit any key characteristics of the *Subtropical and Temperate Coastal Saltmarsh* TEC/PEC, or any other listed ecological community reported from the desktop study. No Threatened flora or fauna species identified from the desktop study as having likely potential to occur were observed during the preliminary site walk-over. Further ecological survey in line with Government recommended methodologies (DBCA 2021; DSEWPaC 2013; EPA 2016; EPA2020) will be required in order to confirm presence or absence of these ecological features on the site.

The majority of the site was found to be comprised of structures or cleared/bitumenised areas devoid of vegetation, or lower stratum vegetation exhibiting varied degrees of degradation. Several small patches of native vegetation with all structural layers present (including canopy species) were observed within or adjacent to road reserve corridors in the LSP, and on distant visual inspection appear to be present in the southern portions of the adjacent existing lots 52, 53 and 54 (refer Attachment A). An accurate evaluation of the condition of this vegetation, and its value as fauna or flora habitat, will require ecological survey to assess native species composition and refine condition ranking.

Recommendations for further ecological survey:

A Reconnaissance flora and vegetation survey and Targeted flora survey should be carried out in October to characterise vegetation present in the LSP and record presence of any conservation-listed flora taxa identified from the desktop study as having 'Likely' potential to occur.

A Basic fauna habitat survey should be undertaken, as well as Targeted survey for conservation-listed fauna taxa, including Threatened bird species known from, or considered 'Likely' to occur at, the site.

The area of potential supratidal TEC/PEC saltmarsh vegetation at the eastern extent of the LSP should be thoroughly surveyed and assessed in spring to evaluate species composition and vegetation condition against criteria contained within the approved *Subtropical and Temperate Coastal Saltmarsh* TEC/PEC conservation advice (DSEWPaC 2013), to confirm if it should be excluded or included in the extent of the local occurrence.

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Survey should be undertaken in line with Western Australian Environmental Protection Authority (EPA) recommendations detailed in *Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016), *Technical Guidance - Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA 2020), and accordant with the *Conservation Advice for SUBTROPICAL AND TEMPERATE COASTAL SALTMARSH* (DSEWPaC 2013).

Should you require clarification regarding this report or the findings and/or recommendations herein, please contact the undersigned on 0456786342 or by email tjones@jbsg.com.au.

Yours sincerely:

Terri Jones

Associate (Ecology)

JBS&G Australia Pty Ltd

Reviewed/Approved by:

Annette Latto

Principal; Team Lead Ecology

JBS&G Australia Pty Ltd

ATTACHMENT A – Draft Development Concept (indicating LSP area) – (ROWE, 2023)

References:

DBCA [Department of Biodiversity, Conservation and Attractions] (2021). *Methods for survey and identification of Western Australian threatened ecological communities.* Draft for consultation. Version 2. 21 December 2021. Government of Western Australia. December 2021. Available from: https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/wa-s-threatened-ecological-communities

DSEWPaC [Department of Sustainability, Environment, Water, Population and Communities] (2013). *Conservation Advice for SUBTROPICAL AND TEMPERATE COASTAL SALTMARSH*. Canberra: Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/118-conservation-advice.pdf. In effect under the EPBC Act from 10-Aug-2013.

EPA [Environmental Protection Authority] (2016). *Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment*. Government of Western Australia. December 2016. Available from: https://www.epa.wa.gov.au/policies-guidance/technical-guidance-flora-and-vegetation-surveys-environmental-impact-assessment

EPA [Environmental Protection Authority] (2020). *Technical Guidance - Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment.* Government of Western Australia. July 2020. Available from: https://www.epa.wa.gov.au/policies-guidance/technical-guidance-terrestrial-vertebrate-fauna-surveys-environmental-impact

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DEVELOPMENT CONCEPT

VARIOUS LOTS, WOOLSTORES PLACE
MOUNT ELPHINSTONE, ALBANY

DRAFT

N

0 62.5 m
SCALE @ A3: 1:2500

9116-CON-02-A

DRAWN: VR
DATE CREATED: 2023.02.01
PROJECTION: MGA50 GDA94
CADASTRE: LANDGATE
SURVEY: HARLEY DYKSTRA 23304-01A

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ROWE GROUP DESIGN

Woolstores Place Ecological Surveys 2023

Rowe Group

Report

JBS&G 65310 | 161,820

22 August 2024

JBS&G

We acknowledge the Traditional Custodians of Country throughout Australia and their connections to land, sea and community.

We pay respect to Elders past and present and in the spirit of reconciliation, we commit to working together for our shared future.

Executive Summary

JBS&G Australia Pty Ltd (JBS&G) were commissioned to undertake a Reconnaissance flora and vegetation survey and Basic fauna survey of nine lots on Woolstores Place, Mt Elphinstone for the development of a Local Structure Plan.

The surveys were undertaken from 25-28 October 2023 by an experienced botanist from JBS&G and an experienced zoologist from Kingfisher Consulting Pty Ltd.

No significant constraints were identified with regards to flora and vegetation, with the majority of the Survey Area having been previously cleared, such that 97% of the Survey Area was in Completely Degraded condition in accordance with Keighery's (1994) scale. A small, and avoidable, section of the Survey Area (0.22 ha) contained part of an EPBC Act listed threatened ecological community, *Subtropical and Temperate Coastal Saltmarsh.* The remaining remnant native vegetation in the Survey Area was likely to be groundwater dependant with the entirety of the site being low-lying/wetland and a small lake being present. Only 27 native flora species were identified in the Survey Area.

The fauna survey identified four listed fauna species, including the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed Western Ringtail Possum (Critically Endangered, 1.4 ha of habitat) and *Biodiversity Conservation Act 2016* (BC Act) Quenda (Priority 4, 8.24 ha of habitat), which were both resident, and Migratory birds (listed under International Agreements) in large numbers utilising the adjacent mudflats, including the EPBC Act listed Fairy Tern (Vulnerable/Migratory). The presence of some listed fauna species (e.g. fish and invertebrates) was not able to be assessed without a targeted survey.

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1. Introduction

Mainbeam Pty Ltd (Mainbeam) are developing a Local Structure Plan (LSP) over nine lots on Woolstores Place, Mount Elphinstone, located within the City of Albany. The LSP area (the 'Survey Area') includes Mainbeam landholdings, as well as other State, Commonwealth, and privately owned land, and is depicted in Figure 1.1. The proposed development's focus will primarily be on the future use and development of the Mainbeam landholdings, exploring a mixture of tourist and quality medium to high density residential, with non-residential commercial land uses considered in close proximity to the rail corridor and future road interchange.

1.1 Survey/Study Area (Delete as applicable)

The Survey Area is located approximately 3.5 km west of the Albany Central Business District in City of Albany and covers a land area of 16.77 ha within the area bound by Frenchman Bay Road, the Princess Royal Harbour waterfront, and the Princess Royal Drive (Figure 1.1).

1.2 Scope of Work

The proposed scope of works for ecological surveys of the LSP includes:

- Reconnaissance-level flora and vegetation survey;
- Targeted flora survey to record the presence of any conservation – listed fauna taxa identified from the desktop study as having 'Likely' potential to occur;
- Basic fauna survey, including a targeted survey for conservation- listed fauna taxa, including threatened bird species known from, or considered 'Likely' to occur at the site; and
- Threatened and Priority Ecological Community survey to evaluate species composition and vegetation condition against criteria contained within the approved Subtropical and Temperate Coastal Saltmarsh TEC/PEC conservation advice (TSSC, 2013).

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Legend

- Survey Area
- Cadastral boundary
- Highway
- Major road
- Minor road
- Track

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Job No: 65310

Client: ROWE Group

Version: A | Date: 11/07/2024

Drawn By: droberts | Checked By: RP

Scale 1:8,000 at A4

0 100 200
metres

Coord. Sys. GDA2020 MGA Zone 50

Woolstores Place, Albany, WA

SURVEY AREA AND REGIONAL LOCATION

FIGURE 1.1

File Name: C:\Users\droberts\JBS&G Australia\JBS&G - DCS - Internal - Documents\Projects\Rowe\65310 Woolstores Ecological Surveys\GIS\02_MapProjects\65310 Woolstores Ecological Surveys R01.aprx
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2. Existing Environment

2.1 Biogeography

The Survey Area occurs in the South-west Botanical Province, in the Southern Jarrah Forest subregion, of the Jarrah Forest region under the Interim Biogeographic Regionalisation for Australia (IBRA) (DEE, 2012).

The Southern Jarrah Forest includes forests south of Collie which slope gently towards the south coast. The region is characterised by Jarrah-Marri (*Eucalyptus marginata-Corymbia calophylla*) forest in the west where rainfall is higher, grading to drier Marri and Wandoo (*Eucalyptus wandoo*) forest in the east (Hearn, et al., 2002).

Within this region, granite outcrops, riparian areas, peaty wetlands act as refugia for species with restricted distributions and/or relict taxa representative of historically wetter and milder climates (Hearn, et al., 2002).

2.2 Climate

The Southern Jarrah Forest sub-region has a warm Mediterranean climate with mild, dry summers and cool, wet winters (Beard, 1990).

The Albany weather station (Station 9500) is positioned approximately 1.5 km from the Survey Area and recorded rainfall data between 1877 and 2024 and temperature data between 1880 and 2024.

The average annual rainfall at Albany was 924.7 mm, with the highest monthly rainfall occurring from May to September. The highest recorded rainfall of 1395.2 mm was received in 1955. 2023 received 863.1 mm of rainfall, approximately 93% of the long-term average (BOM, 2024).

The average monthly maximum temperature at Albany ranges from 15.8 °C in July to 22.9 °C in February. Average monthly minimum temperatures range from 8.2 °C in July to 15.6 °C in February (BOM, 2024).

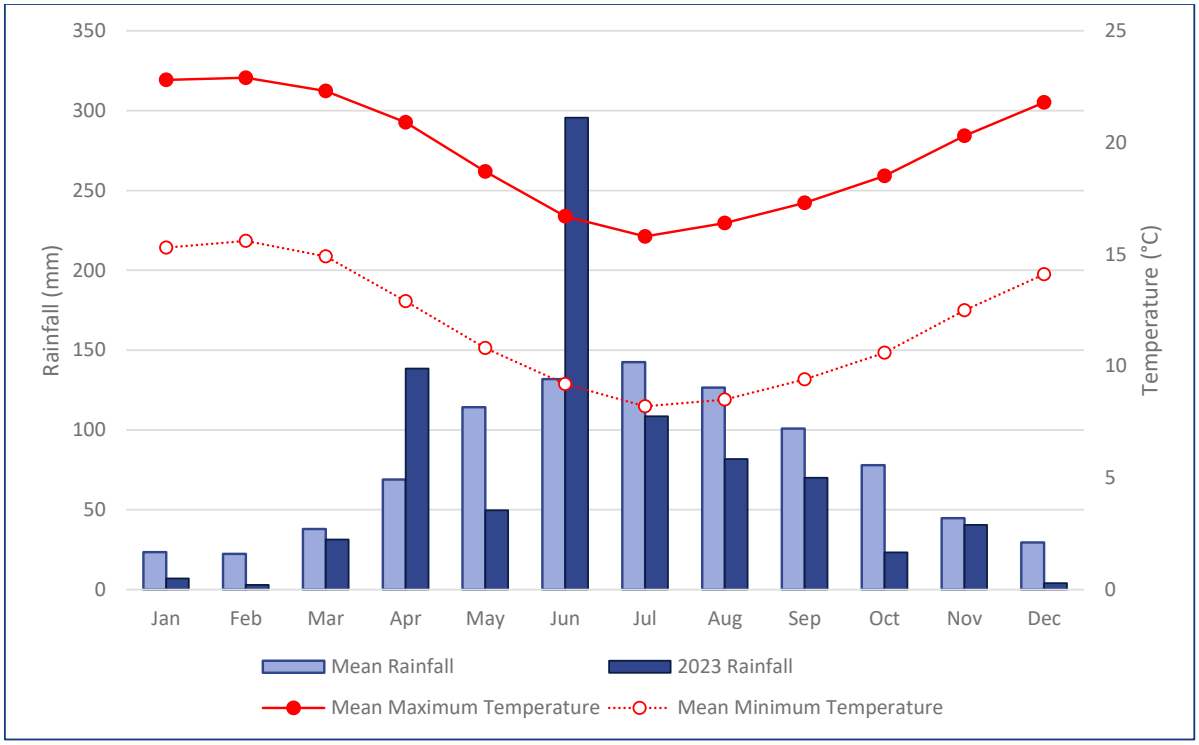

Figure 2.1 Climate data for the Albany weather station (station 9500)

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2.3 Soils and Landforms

2.3.1 Soil-landscape Systems

Two soil-landscape systems are mapped in the Survey Area, the Gardner granite phase and the Owingup subsystem (DPIRD, 2018). Department of Primary Industry and Regional Development (DPIRD) spatial data does not cover the full extent of the Survey Area, so area of this mapping does not tally up to 16.77 ha.

Table 2.1 Soil-landscape systems mapped within the Survey Area

Land System Code System Name	Description	Area (ha)	Proportion of the Survey Area
242MmGAg Gardner granite phase	Granite outcrop.	0.14	0.92 %
242TbOW Owingup subsystem	Plains with swamps, lunettes and dunes. Yellow solonetzic soils, organic loams and diatomaceous earth; Wattle-Paperbark thickets, Teatree heath and reeds. Podzols on dunes; Banksia-Sheoak woodland.	15.55	99.08 %

2.3.2 Topography

The Survey Area is low-lying and occurs at less than 10 m above sea level. The southernmost portion of the Survey Area is an artificial landform (Plate 1, Figure 2.2), with historic aerial photography indicating that this area was originally saltmarsh, with land reclaimed for the Albany Woolstores between 1954 and 1977 (Landgate, 2024). The northern portion of the Survey Area was cleared but not filled historically.

Plate 1 An artificial rock-wall at the southern side of the Survey Area

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Legend

- Survey Area
- Soils-landscape Systems (DPIRD-027)
  - Gardner granite phase
  - Gardner sandy phase
  - Mattaband yellow duplex phase
  - Owingup subsystem
- Topographic contours - 2m

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Scale 1:8,000 at A4

0 100 200
metres

Coord. Sys. GDA2020 MGA Zone 50

Woolstores Place, Albany, WA

SOILS-LANDSCAPE SYSTEMS AND TOPOGRAPHY

FIGURE 2.2

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Image Reference: www.nearmap.com© - Imagery Date: February 10. 2024

2.4 Inland Waters

2.4.1 Surface Water

The Survey Area lies adjacent to, and extends into, the Princess Royal Harbour. The Survey Area is only slightly above sea level and norther parts of the site contain swamp. No fine scale contour mapping is available for the Survey Area.

The Survey Area does not occur near any important wetlands (DCCEEW, 2022; DBCA, 2017a; DBCA, 2017b).

2.4.2 Groundwater

The Survey Area occurs in the Princess Royal Harbour catchment of the Albany Coast basin. The Survey Area falls within the Karri groundwater sub-area (DWER, 2017). Little information is available about the coastal portions of this sub-area.

2.5 Regional Vegetation

On 10 November 2023, Australia's environment ministers agreed on 6 priority areas for national targets under Australia's Strategy for Nature. These included protecting and conserving 30 % of Australia's land and 30 % of Australia's oceans by 2030 (DCCEEW, 2024).

One pre-European vegetation association coincides with the Survey Area, Albany – 3 (Table 2.2 and Figure 2.4). More than 30 % of the pre-European extent of Albany – 3 remains at a local and regional scale.

Table 2.2 Pre-European vegetation associations/sub-associations and their extent

Vegetation Sub-Association	Scale	Pre-European Extent (ha)	Current Extent (ha)	% Remaining
Albany - 3 Medium forest; jarrah-marri	Western Australia	2,661,404.62	1,803,437.48	67.76
	Jarrah Forest IBRA Region	2,390,591.54	1,604,101.56	67.10
	Southern Jarrah Forest IBRA Sub-region	1,482,491.85	880,655.65	59.40
	City of Albany	50,509.32	16,024.66	31.73

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Legend

- Survey Area
- Cadastral boundary
- Topographic contours - 2m

Hydrography, linear (DWER-031)

- Drain - minor
- Lake - perennial
- Lake - artificial
- Earth Dam
- Highway
- Major road
- Minor road
- Track

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Scale 1:8,000 at A4

0 100 200
metres

Coord. Sys. GDA2020 MGA Zone 50

Woolstores Place, Albany, WA

SOILS-LANDSCAPE SYSTEMS AND TOPOGRAPHY

FIGURE 2.3

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Legend

Survey Area

Pre-European Vegetation (DPIRD-006)

ALBANY_128

ALBANY_3

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Job No: 65310

Client: ROWE Group

Version: A | Date: 11/07/2024

Drawn By: droberts | Checked By: RP

Scale 1:8,000 at A4

0 100 200

metres

Coord. Sys. GDA2020 MGA Zone 50

Woolstores Place, Albany, WA

PRE - EUROPEAN VEGETATION

FIGURE 2.4

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2.6 Previous Surveys

The *Albany Regional Vegetation Survey* (Sandiford & Barrett, 2010) spanned 124,415 ha extending 30 km east and west of Albany and 20 km to the north. The survey defined 67 vegetation units, including several communities now listed at a State or Commonwealth level. More than 800 species were recorded during the survey, including 49 taxa then listed at a State or Commonwealth level (Sandiford & Barrett, 2010). The regional vegetation map produced by the *Albany Regional Vegetation Survey* did not show the Survey Area as being vegetated, but identified *Juncus kraussii* Sedgeland, Peppermint Low Forest and Coastal *Melaleuca cuticularis* Low Forest as occurring to either side of the Survey Area (Sandiford & Barrett, 2010).

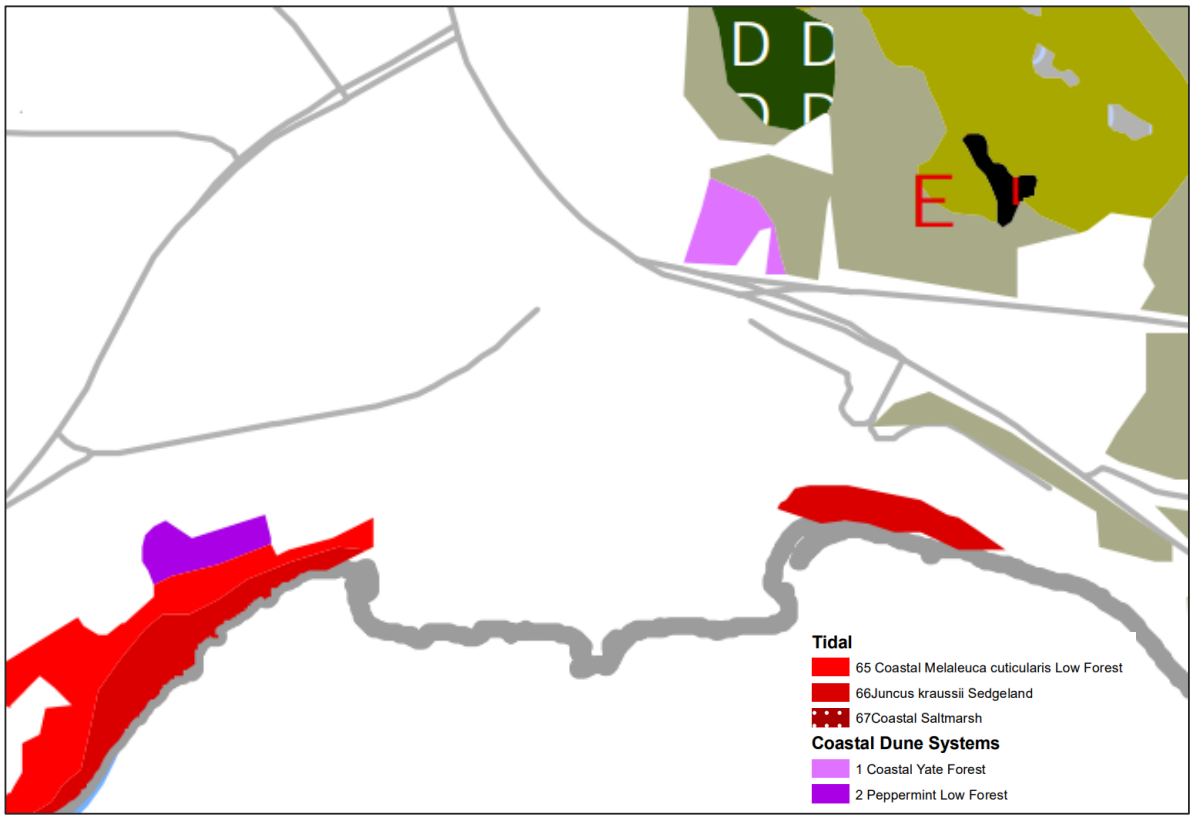

Plate 2 Albany Regional Vegetation Survey vegetation map

A biological survey was undertaken north of the Survey Area as part of studies undertaken for the Albany Ring Road: *Biological Survey: Albany Ring Road* (Southern Ecology, 2020). This survey incorporated the northern portion of the Survey Area. Southern Ecology (2020) identified most of this area as Completely Degraded *"isolated plants (pasture and herbaceous weeds with isolated plants)"* with small areas of Yate (*Eucalyptus cornuta*) woodland and *Melaleuca preissiana* low woodland (Plate 3). Of the area identified as Yate woodland, only a single tree lies within the Survey Area.

Southern Ecology (2020) considered *Melaleuca preissiana* low woodland to be regionally significant as a wetland habitat. They also noted the presence of the Subtropical and Temperate Coastal Saltmarsh Threatened Ecological Community (TEC) (Vulnerable) approximately 100 m from Southern Ecology's survey on the margin of Princess Royal Harbor.

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Plate 3 Vegetation mapping by Southern Ecology (2020)

No listed flora were identified in the Survey Area by Southern Ecology, who recorded four Priority flora taxa in their broader survey:

- *Thysanotus isantherus* (P4) approximately 200 m east of the Survey Area;
- *Boronia crassipes* (P3);
- *Andersonia* sp. Jamesii (J. Liddelow 84) (P4); and
- *Synaphea incurva* (P3).

Southern Ecology also recorded five significant fauna species:

- Carnaby's Black Cockatoo (*Zanda latirostris*) (T-EN)
- Baudin's Black Cockatoo (*Zanda baudinii*) (T-EN)
- Forest Red-tailed Black Cockatoo (*Calyptorhychus banksii naso*) (T-VU)
- Western Ringtail Possum (*Pseudocheirus occidentalis*) (T-CR)
- Southern Brown Bandicoot (*Isoodon obesulus fusciventer*) (P4)

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2.7 Significant Ecological Communities

2.7.1 Database Searches

A search of Department of Biodiversity, Conservation and Attractions (DBCA) flora communities and fauna databases and DCCEEW's Protected Matters Search Tool for listed ecological communities occurring within 15 km of the Survey Area . Four significant ecological communities were listed by DBCA as occurring within 15 km of the Survey Area

Table 2.3 Significant ecological communities listed in databases as occurring near the Survey Area

ID	Community	State	Cth
Coastal *Melaleuca incana/Taxandria juniperina*	Coastal *Melaleuca incana / Taxandria juniperina* Shrubland/Closed Forest	Priority 1	Not listed
Banksia littoralis/Melaleuca incana	*Banksia littoralis* woodland / *Melaleuca incana* Shrubland	Priority 1	Not listed
Astartea scoparia Swamp Thicket	*Astartea scoparia* Swamp Thicket	Priority 1	Not listed
126 *Banksia coccinea* thicket	Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia • *Banksia coccinea* Shrubland/*Eucalyptus staeri*/Sheoak Open Woodland (Community 14a - Sandiford & Barrett 2010) (all/or portion in EPBC listed Kwongkan community)	Priority 1	Endangered
118	*Subtropical and Temperate Coastal Saltmarsh*	Priority 3	Vulnerable
174	*Empodisma peatlands of southwestern Australia*	Not listed[1]	Vulnerable

2.7.2 Groundwater Dependent Ecosystems

Geoscience Australia describes Groundwater Dependent Ecosystems as those that rely on groundwater for some, or all, of their water requirements (Geoscience Australia, 2023). This can broadly apply to many ecosystems in Australia, so six types of GDEs have been identified in Australia:

- Terrestrial vegetation that relies on the availability of shallow groundwater;
- Wetlands such as paperbark swamp forests and mound springs;
- River baseflow systems where groundwater discharge provides a significant baseflow component to the river;
- Aquifer and cave ecosystems where life exists independent of sunlight;
- Terrestrial fauna, both native and introduced species, that rely on groundwater as a source of drinking water; and
- Estuarine and near-shore marine systems, such as coastal mangroves, salt marshes and sea-grass beds, which rely on the submarine discharge of groundwater.

These have been categorised into three categories (BOM, 2017):

- Aquatic ecosystems which rely on the surface expression of groundwater, such as rivers, wetlands and springs (this can also include marine and estuarine ecosystems);

[1] DBCA advise that a number of South-west communities have peat associations that may be listed as other ecological communities at a State level.

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- Terrestrial ecosystems which rely on the subsurface presence of groundwater, including groundwater dependent terrestrial vegetation; and
- Subterranean ecosystems including cave and aquifer ecosystems.

Aquatic and subterranean environments are not included in flora and vegetation surveys for Environmental Impact Assessment so are not covered by this report.

Regionally, the following vegetation has been identified as Groundwater Dependent:

- Base-flow ecosystems in south-western Western Australia (Hatton & Evans, 1998);
- The jarrah forest and Banksia woodlands of south-western Western Australia (limited dependence) (Hatton & Evans, 1998);
- Coastal mangrove and salt marsh ecosystems (limited dependence) (Hatton & Evans, 1998);
- The near-shore stromatolite systems of coastal Western Australia (Hatton & Evans, 1998);
- Karstic groundwater ecosystems of Exmouth Cape, Yanchep Caves, the Nullarbor and elsewhere (Hatton & Evans, 1998); and
- Karst ecosystems including those on the Nullarbor (Hatton & Evans, 1998);

2.8 Significant Flora

Flora, or populations of flora, may be considered significant for a range of reasons, including:

- Conservation dependent taxa (including those identified as a threatened or priority taxa);
- Being locally endemic, geographically restricted or associated with a restricted habitat type, including phreatophytic species;
- Novel, hybrid or taxonomically unusual taxa;
- Geographically isolated populations and range extensions;
- Bush tucker, bush medicine species and culturally important species; and
- Keystone species or those which provide critical habitat for fauna species.

2.8.1 Conservation Listed Flora

2.8.1.1 Database Searches

A search of DBCA databases and the Protected Matters Search Tool identified 77 conservation listed flora occurring within 15 km of the Survey Area (Figure 2.5). Of these, a likelihood assessment (Appendix C) identified 29 taxa as likely to occur within the Survey Area based on nearby records (within 5 km) and a desktop assessment of potential habitats present. A further 25 taxa were considered to possibly occur in the Survey Area based on their preferred habitats but were not known to occur in the immediate vicinity of the Survey Area (Table 2.4). Two recently State-listed threatened species (upgraded 6 October 2023) were not yet listed under the EPBC Act, *Conospermum quadripetalum* and *Isopogon buxifolius* subsp. *buxifolius*.

Table 2.4 Summary of likelihood assessment

State Listing (State of Western Australia, 2023)	Likely	Possible	Unlikely	Total
Critically Endangered (CR)	4	0	2	**6**
Endangered (EN)	0	4	3	**7**
Vulnerable (VU)	2	0	3	**5**
Priority 1 (P1)	3	1	2	**6**

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State Listing (State of Western Australia, 2023)	Likely	Possible	Unlikely	Total
Priority 2 (P2)	7	5	2	**14**
Priority 3 (P3)	5	11	5	**21**
Priority 4 (P4)	8	6	6	**20**
Total	**29**	**27**	**23**	**79**

Taxa considered likely to occur, and their WA conservation status, were:

Threatened Flora:

- *Banksia brownii* (CR)
- *Caladenia harringtoniae* (VU)
- *Calectasia cyanea* (CR)
- *Conospermum quadripetalum* (CR)
- *Conostylis misera* (VU)
- *Isopogon uncinatus* (CR)

Priority Flora:

- *Acacia ataxiphylla* subsp. *ataxiphylla* (P3)
- *Adenanthos x cunninghamii* (P4)
- *Agrostocrinum scabrum* subsp. *littorale* (P2)
- *Boronia crassipes* (P3)
- *Chorizema carinatum* (P3)
- *Conospermum spectabile* (P2)
- *Drosera paleacea* (P1)
- *Gahnia sclerioides* (P4)
- *Gonocarpus pusillus* (P4)
- *Lepidium pseudotasmanicum* (P4)
- *Leucopogon alternifolius* (P3)
- *Leucopogon bracteolaris* (P2)
- *Lysinema lasianthum* (P4)
- *Microtis pulchella* (P4)
- *Microtis quadrata* (P4)
- *Prasophyllum paulinae* (P1)
- *Stylidium articulatum* (P2)
- *Stylidium falcatum* (P2)
- *Styphelia cymbiformis* (P2)
- *Synaphea preissii* (P3)
- *Thelymitra porphyrosticta* (P2)
- *Thomasia multiflora* (P1)
- *Thomasia solanacea* (P4)

2.8.1.2 Nearby Surveys

No additional flora were identified by Southern Ecology (2020) that were not captured by database searches. Of the four significant flora taxa identified by Southern Ecology, *Synaphea incurva* (P3) occurred within 5 km of the Survey Area, however its preference for slopes means it's unlikely to occur within the Survey Area.

2.8.2 Other Significant Flora

2.8.2.1 Phrase Name Species

'Phrase name' flora taxa are those which have not yet been formally named and described. Approximately 59 phrase name flora taxa occur within Shire of Albany (WAHerb, 1998-). This number fluctuates as species are formally named and described, and as new species are identified.

2.8.2.2 Geographically Restricted Flora

Taxa which rely on granite outcropping are usually geographically restricted. The Great Southern region is known for its granite outcropping, and approximately 111 native flora taxa were associated with granite outcropping in the Shire of Albany (WAHerb, 1998-). This did not include phrase name species which have not yet had habitat information input to Florabase.

A small section of the Survey Area is mapped as granite outcrop (DPIRD, 2018).

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2.8.2.3 Groundwater Dependent Flora

Phreatophytic species are reliant on access to groundwater reserves for persistence and are thus considered to be groundwater dependent. Groundwater dependent species may be 'obligate' phreatophytes, dependent on free access to groundwater, or 'facultative' phreatophytes, which require access to groundwater resources when the soil surface moisture is depleted but are able to utilise surface water during periods of rainfall (Nevill, et al., 2010).

Regionally, taxa known to occur only in wetlands or riparian vegetation should be treated as obligate phreatophytes, while many taxa and communities may be facultative phreatophytes.

2.8.2.4 Flora Associated with Significant Vegetation

Locally the following flora can be considered significant as indicators of Threatened and Priority Ecological Communities:

- *Melaleuca incana*
- *Taxandria juniperina*
- *Banksia littoralis*
- *Astartea scoparia*
- *Banksia coccinea*
- *Eucalyptus staeri*
- *Allocasuarina* spp.
- Proteaceae spp.
- Saltmarsh species (Chenopod species, *Suaeda australis, Threlkeldia diffusa, Juncus* spp. etc.)
- *Empodisma gracillimum*

2.9 Significant Fauna

One hundred and one listed fauna species were identified by database searches as potentially occurring in the Survey Area (excluding purely marine species such as marine fish, sharks, turtles and whales). This included 40 listed as threatened under the EPBC Act, ten only listed as threatened under the BC Act, and 45 listed as Migratory or under an International Agreement (Table 2.5, Figure 2.6). A full assessment of the potential for these taxa to occur in the Survey Area is provided in Appendix B.

Table 2.5 Number of listed species potentially occurring in the Survey Area

Class	Western Australia Only					Commonwealth						
	P1	P2	P3	P4	T	CR	EN	EN/MI	MI	VU	VU/MI	Total
Bird			1	3	3	2	8	4	35	11	5	**72**
Invertebrate			1		3		1			1		**6**
Mammal				5	3	2	3	1		3		**17**
Reptile		1										**1**
Fish					1		2					**2**
Total	**0**	**1**	**2**	**8**	**10**	**4**	**15**	**5**	**35**	**15**	**5**	**101**

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Legend

Survey Area

Threatened and Priority Ecological Communities

- *Astartea scoparia* Swamp Thicket (Priority 1)
- *Banksia coccinea* Shrubland *Eucalyptus staeri* Sheoak Open Woodland (Priority 1)
- *Banksia littoralis* woodland / Melaleuca incana Shrubland, (Priority 1)
- Coastal *Melaleuca incana* / *Taxandria juniperina* Shrubland/Closed Forest (Priority 1)
- Subtropical and Temperate Coastal Saltmarsh (Priority 3)

Significant Flora Conservation code

- Threatened
- Priority 1
- Priority 2
- Priority 3
- Priority 4

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Client: ROWE Group

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Drawn By: droberts | Checked By: RP

Scale 1:50,000 at A3

0 1 2
Kilometers

Coord. Sys. GDA2020 MGA Zone 50

Woolstores Place, Albany, WA

DATABASE SEARCH

FIGURE 2.5

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Image Reference: SLIP_Public_Services_Locate: www.nearmap.com© - Imagery Date: 28. May 2022.

Legend

- Survey Area

Conservation status

- Critically endangered
- Endangered
- Vulnerable
- Extinct
- Conservation dependant
- Other specifically protected
- Migratory
- P2
- P3
- P4
- Highway
- Major road

JBS&G

Job No: 65310	
Client: ROWE Group	
Version: A	Date: 16-Aug-2024
Drawn By: ianandagoda	Checked By: RP

Scale 1:180,000 at A3

0 1 2
Kilometers

Coord. Sys. GDA2020 MGA Zone 50

Woolstores Place, Albany, WA

FAUNA DATABASE SEARCH

FIGURE 2.6

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Image Reference: SLIP_Public_Services_Locate:

3. Methods

3.1 Personnel

The field assessment of the Survey was led by an experienced botanist from JBS&G and an independent consultant Zoologist (Table 3.1), with more than 5 years' experience in the bioregion as required by EPA guidance.

Table 3.1 Key Personnel

Name	Experience	Role	Permits
Rachael Pratt (JBS&G)	21 years	Botanist	FB62000141-2 (13 Sep 2022-12 Sep 2025) TFL 2223-0029 (26 Jul 2022-31 Jul 2025)
Jeff Turpin (Kingfisher Environmental Consulting)	22 years	Zoologist	n/a
Frank Obbens	31 years	Taxonomist	n/a

3.2 Desktop Assessment

Requests were made to DCCEEW and DBCA for data from key databases to generate a list of significant vascular flora, fauna and ecological communities previously recorded within, and in the vicinity of, the Survey Area. A subset of these results was generated based on a buffer distance of 20 km from the Survey Areas (Table 3.2). This information was supplemented with additional data on broad fauna and flora assemblage within a 150 m buffer of the Survey Area.

Table 3.2. Database searches

Data Custodian	Database	Search Buffer
DCCEEW	Protected Matters Search Tool (flora records on MNES protected under the EPBC Act.)	20 km
DBCA	Threatened and Priority Ecological Communities	20 km
DBCA	Threatened (Declared Rare) and Priority Flora (TPFL)	20 km
DBCA	WA Herbarium	20 km
DBCA	Threatened and Priority Fauna	20 km
DBCA	Black Cockatoo Roosting Sites (Great Cocky Count)	20 km
DBCA	White-tailed Black Cockatoo Breeding Site Locations	20 km
BirdLife	BirdData	150 km
DBCA	Naturemap (Records from the Western Australian Museum (WAM) and Department of Biodiversity, Conservation and Attractions (DBCA) databases, including historical data and Threatened and Priority species in WA)	150 km
DCCEEW	Protected Matters Search Tool (fauna records on MNES protected under the EPBC Act.)	150 km
CSIRO	Atlas of Living Australia (fauna records from Australian museums and conservation/research bodies.)	150 km

Species identified by database searches and nearby survey work were assessed for their likelihood of occurring in the Survey Area based on proximity to the Survey Area and the presence of suitable habitat (Table 3.3 and Table 3.4).

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Table 3.3 Flora likelihood assessment categories

Likelihood	Definition
Present	The taxon has been recorded within the Survey Area.
Likely	The Survey Area contains suitable habitat for the taxon and it is likely the taxon may occur based on presence of a recent historical record close to (within 5 km) the Survey Area.
Possible	The Survey Area contains suitable habitat for the taxon but there is no other information to suggest that the taxon may occur within or close to the Survey Area, or habitat information is lacking for the taxon.
Unlikely	The Survey Area does not contain suitable habitat for the taxon, regional records suggest the taxon does not occur near the Survey Area , or the Survey Area contains suitable habitat for the taxon within which thorough targeted searches were completed and conclusion has been made that the taxon is unlikely to be present.
Absent	Habitats present within the Survey Area preclude the possibility of this taxon occurring. E.g. aquatic taxa at a Survey Area where no seasonally inundated areas occur.

Table 3.4 Fauna likelihood assessment categories, adapted from Bamford Consulting Ecologists (2024)

Likelihood	Definition
Resident	Taxa with a population permanently present in the Survey Area.
Regular migrant or visitor	Taxa that occur within the Survey Area regularly in at least moderate numbers, such as part of an annual cycle.
Irregular visitor	Taxa that occur within the Survey Area irregularly such as nomadic and irruptive species. The length of time between visitations could be decades but when the species is present, it uses the Survey Area in at least moderate numbers and for some time.
Vagrant	Taxa that occur within the Survey Area unpredictably, in small numbers and/or for very brief periods. Therefore, the Survey Area is unlikely to be of importance for the species.
Absent	No habitat occurs within the Survey Area or the Survey Area is outside the known range of the taxon.
Locally extinct	Taxa that would have been present but has not been recently recorded in the local area and therefore is almost certainly no longer present in the Survey Area.
(Other)	Specific comment with respect to likelihood.

3.3 Field Survey

3.3.1 Survey Rationale

JBS&G plan and implement flora and vegetation surveys to comply with legislation, regulations and standards detailed in the guidelines required for environmental impact assessment (EIA). A reconnaissance survey was chosen for this site with consideration to its clearing and survey history. The site had been previously cleared, included an artificial landform, and was part of the *Biological Survey: Albany Ring Road* (Southern Ecology, 2020). With this in mind, a Reconnaissance survey in combination with targeted flora surveys, an assessment of potential TECs and a basic fauna survey were considered appropriate.

3.3.2 Reconnaissance Flora Survey

The reconnaissance flora and vegetation survey was undertaken from 25-27 October 2023. The Survey Area was traversed predominantly on foot, with an attempt made to visit all vegetation units within the Survey Area based on observations of aerial photography.

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For each vegetation unit, a description was prepared of structural form and dominant species and likely vegetation boundaries were marked on a map or recorded by GPS. A minimum of one relevé was recorded for each vegetation unit, unless they were too small to map at the scale of the survey.

Within each relevé, the following were recorded:

- Site code;
- Location, with GPS coordinate and datum;
- Photograph of vegetation;
- Landform and soil description;
- Vegetation structural description and dominant species;
- Assessment of vegetation condition;
- A species list, including weeds; and

3.3.3 Targeted Flora Survey

A targeted flora survey was undertaken within remnant native vegetation in the Survey Area. The area was not systematically traversed at 10 m intervals due to dense swamp vegetation which required a more ad-hoc approach where impenetrable vegetation had to be avoided. Instead additional time was spent in these areas, looking into and under dense vegetation from the edges, while traversing gaps at a suitable intensity but in a non-linear manner.

Note: current DBCA terms and conditions for the collection of threatened flora prevent the disclosure of specific locality information of threatened flora populations to other persons without the written permission of the CEO.

3.3.4 Basic Fauna Survey

A basic fauna survey was undertaken in accordance with EPA's (2020) *Technical Guidance - Terrestrial vertebrate fauna surveys for environmental impact assessment*.

This included an assessment of vegetation and soil associations and microhabitats present, and broad habitat mapping. Opportunistic fauna observations were be made during the habitat assessment.

Three camera traps were set 25-28 October (Table 3.5, Figure 3.1) and bird surveys conducted throughout and on adjacent mudflats, over two consecutive mornings and afternoons. Targeted searching for signs of significant fauna was conducted throughout, and once Western Ringtail Possums signs were observed, a wider transect was searched to identify the species presence.

Table 3.5 Camera trap locations

Camera Name	Datum	Latitude	Longitude	Habitat
C1	GDA2020	-35.0243271	117.8619259	Densely vegetated drainage
C2	GDA2020	-35.0251351	117.8608117	Peppermint thicket
C3	GDA2020	-35.0265703	117.8599226	Peppermint thicket

3.4 Specimen Identification

Flora samples collected during the survey had information recorded that allows for identification and allocation to the correct sample site or collection location. Specimens were pressed in the field so that as many identifiable characteristics were preserved and to ensure that they dried correctly. Taxonomic work was completed with reference to appropriate keys and other works by personnel with adequate skills and training. Samples that could be identified, were conservation significant, potential novel species or range extensions

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were be submitted to the Western Australian Herbarium for identification. Nomenclature followed Florabase (WAHerb, 1998-).

3.5 Data analysis

3.5.1 Vegetation units

Vegetation units were delineated using a combination of sample site data, site observations and cluster analysis. Aerial photography interpretation and field notes taken during the survey were then used to develop vegetation mapping polygon boundaries over the Survey Area. These polygon boundaries were then digitised using GIS software.

Vegetation descriptions have been adapted from the (NVIS) Australian Vegetation Attribute Manual Version 7.0 (NVIS Technical Working Group 2017), a system of describing structural vegetation units (based on dominant taxa). This model follows nationally agreed guidelines to describe and represent vegetation types, so that comparable and consistent data is produced nation-wide.

3.6 Constraints and Limitations

The survey was evaluated against a range of standard limitations (Table 3.6) identified by EPA (2016) which are required to be addressed for every survey. Based on this evaluation, the assessment was subject to limitations or constraints that have affected the thoroughness of the assessment and the conclusions reached.

Table 3.6 Flora and Vegetation Survey Potential Limitations and Constraints

Potential Limitation	Impact on Assessment	Comment
Availability of contextual information at a regional and local scale	Not a constraint	Adequate regional and local contextual information was available.
Proportion of flora Recorded and/or collected, any identification issues	Not a constraint	Some taxa were incompletely identified, however this was not considered to be a constraint for a Reconnaissance level survey and those taxa were able to be excluded as listed flora taxa.
Was the appropriate area fully surveyed (extent and effort)	Not a constraint	The Survey Area was fully surveyed sufficient for a Reconnaissance level survey.
Survey timing, rainfall, season of survey	Not a constraint	The survey was conducted in spring 2023, which received 93% of the long-term average rainfall.
Disturbance that may have affected the results of the survey such as fire, flood or clearing	Not a constraint	There were no recent disturbances which affected the results of the Survey.
Access problems (i.e., ability to access Survey Area).	Minor constraint	The Survey Area was boggy and much of it was full of tall grass, within which footing was unsure. This prevented traversing through some of the historically cleared areas of the Survey Area. One vegetation unit on the foreshore was in deep mud and could not be accessed.
Competency/experience of the team carrying out the survey, including experience in the bioregion surveyed	Not a constraint	Lead Botanist Rachael Pratt has >5 years' experience in the Jarrah Forrest IBRA bioregion.

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Table 3.7 Fauna Survey Potential Limitations and Constraints

Potential Limitation	Impact on Assessment	Comment
Availability of data and information	Not a constraint	Adequate regional and local contextual information was available.
Competency/experience of the survey team, including experience in the bioregion surveyed	Not a constraint	Lead Zoologist Jeff Turpin is experienced in systematic fauna surveys and fauna identification and has extensive experience of the fauna of the Jarrah Forrest IBRA region.
Scope of the survey, e.g. where faunal groups were excluded from the survey	Not a constraint	No vertebrate fauna groups were excluded, however this was a Basic fauna survey only.
Timing, weather and season	Not a constraint	The survey was undertaken during spring, following adequate rainfall, during the primary season for reptiles, bush birds and mammals. Although out of season, sufficient water was present at the site that frogs were active. The survey did not occur at peak times for migratory birds, however the Survey Area did not contain significant wetlands and was adjacent to mudflats which would see more use by migratory birds.
Disturbance that may have affected results, e.g. fire, flood	Not a constraint	There were no recent disturbances which affected the results of the Survey.
The proportion of fauna identified, recorded or collected	Not a constraint	The proportion of fauna identified and recorded was adequate for a Basic fauna survey.
Adequacy of the survey intensity and proportion of survey achieved, e.g. the extent to which the area was surveyed	Not a constraint	All habitats within the Survey Area were accessible.
Access problems	Minor constraint	The Survey Area was boggy and much of it was full of tall grass, within which footing was unsure. This prevented traversing through some of the historically cleared areas of the Survey Area.
Problems with data and analysis, including sampling biases	Not a constraint	No sampling biases or other problems with data and analyses were encountered.

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Legend

- Survey Area
- Cadastral boundary
- Releve
- Camera trap
- Traverse
- Highway
- Major road
- Minor road
- Track

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Job No: 65310

Client: ROWE Group

Version: A	Date: 16/08/2024
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Scale 1:2,800 at A4

0 50 100
metres

Coord. Sys. GDA2020 MGA Zone 50

Woolstores Place, Albany, WA

SURVEY EFFORT

FIGURE 3.1

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4. Results

4.1 Flora

4.1.1 Flora Assemblage

Eighty vascular flora taxa from 69 genera and 37 families were recorded during the survey, including 53 introduced taxa. No species accumulation curve has been prepared for this assessment because of the highly degraded nature of the site and its unusual diversity of introduced flora taxa.

4.1.2 Introduced Flora

Fifty-three introduced flora taxa were recorded during the survey, including two weeds listed as Declared Pests under the BAM Act:

- *Acacia longifolia* subsp. *longifolia*
- *Asparagus asparagoides*
- *Avena barbata*
- *Briza maxima*
- *Briza minor*
- *Callistemon sp.*
- *Cenchrus clandestinus*
- *Centella asiatica*
- *Cirsium vulgare*
- *Coprosma repens*
- *Cortaderia selloana*
- *Cotula coronopifolia*
- *Crassula glomerata*
- *Cupressaceae* sp.
- *Cynodon dactylon*
- *Dipogon lignosus*
- *Erigeron bonariensis*
- *Eucalyptus globulus*
- *Eucalyptus petiolaris*
- *Euphorbia paralias*
- *Fumaria muralis* subsp. *muralis*
- *Gaudium laevigatum*
- *Geranium molle*
- *Hypochaeris glabra*
- *Juncus oxycarpus*
- *Lagunaria patersonia*
- *Lagurus ovatus*
- *Lemna minor*
- *Lolium* sp.
- *Lophostemon confertus*
- *Lotus subbiflorus*
- *Lysimachia arvensis*
- *Metrosideros* sp.
- *Oxalis pes-caprae*
- *Pelargonium capitatum*
- *Physalis peruviana*
- *Phytolacca octandra*
- *Plantago sp.*
- *Polypogon monspeliensis*
- *Psoralea pinnata*
- *Rubus ulmifolius*
- *Rumex acetosella*
- *Salix babylonica*
- *Solanum laciniatum*
- *Solanum nigrum*
- *Sonchus asper*
- *Stachys arvensis*
- *Stenotaphrum secundatum*
- *Tamarix aphylla* Declared Pest - s22(2)
- *Tropaeolum majus*

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- *Watsonia meriana*
- *Yucca aloifolia*
- *Zantedeschia aethiopica* Declared Pest - s22(2)

4.1.3 Significant Flora

4.1.3.1 Listed Flora

No flora listed as Threatened or Priority at a State or Commonwealth level were identified during the Survey.

4.1.3.2 Other Significant Flora

Tecticornia ?indica subsp. *bidens, Juncus ?krausii* and *Threlkeldia diffusa* were identified during the Survey. These species are associated with the TEC *Subtropical and Temperate Coastal Saltmarsh* listed as Vulnerable under the EPBC Act.

4.1.4 Unidentified Flora

Several flora taxa were unable to be completely identified. This was usually due to an absence of reproductive material at the time of the survey. Some weeds were not collected, e.g. *Plantago* sp. because identifying the taxon to species level would not materially benefit the outcomes of the survey. One taxon, Cupressaceae sp. was an introduced conifer which was too tall to collect a specimen from.

4.2 Vegetation

4.2.1 Vegetation Units

Six vegetation units were identified in the Survey Area. The majority of these were dominated by weed taxa and poorly defined. Only three were considered to be of adequate condition to justify relevé assessment and of these, the *Juncus pallidus* closed sedgeland was inaccessible due to thick mud.

Table 4.1 Vegetation Units

Vegetation Unit	Area (ha)	Proportion of Survey Area	Photo
Juncus pallidus closed sedgeland over sparse mixed weeds and *Threlkeldia diffusa*	0.22	1.30%	

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Vegetation Unit	Area (ha)	Proportion of Survey Area	Photo
Melaleuca rhaphiophylla closed woodland over patches of *Taxandria juniperina*, over sparse forbland of *Isolepis prolifera, Microtis media, *Centella asiatica, *Zantedeschia aethiopica* and **Cotula coronopifolia* (Relevé 3)	0.26	1.53%	
Parkland cleared woodland of *Melaleuca rhaphiophylla* and *Agonis flexuosa* interspersed with **Salix babylonica* over *Pteridium esculentum* and mixed weed species	0.73	4.33%	
Tall shrubland of **Acacia longifolia, *Gaudium laevigatum* and ?**Syzygium smithii* with patches of emergent *Agonis flexuosa* over **Cenchrus clandestinus,* mixed weeds and isolated *Anigozanthos viridis*	0.22	1.32%	

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Vegetation Unit	Area (ha)	Proportion of Survey Area	Photo
Woodland of *Eucalyptus cornuta* and **Eucalyptus globulus* over *Agonis flexuosa*, over *Pteridium esculentum, *Stenotaphrum secundatum, *Cenchrus clandestinus* and **Pelargonium capitatum* (Relevé 1)	0.28	1.66 ha	
Parkland cleared	6.76 ha	44.33%	
Unvegetated	8.30	49.53%	
Total	**16.77**		

One additional vegetation unit was described adjacent to the Survey Area:

- Low, closed samphire shrubland of *Tecticornia ?indica* subsp. *bidens*, with sparse **Juncus ?kraussii* subsp. *australiensis* and *Threlkeldia diffusa*. (Relevé 2)

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Plate 4 Fringing Temperate and Subtropical Saltmarsh outside the Survey Area

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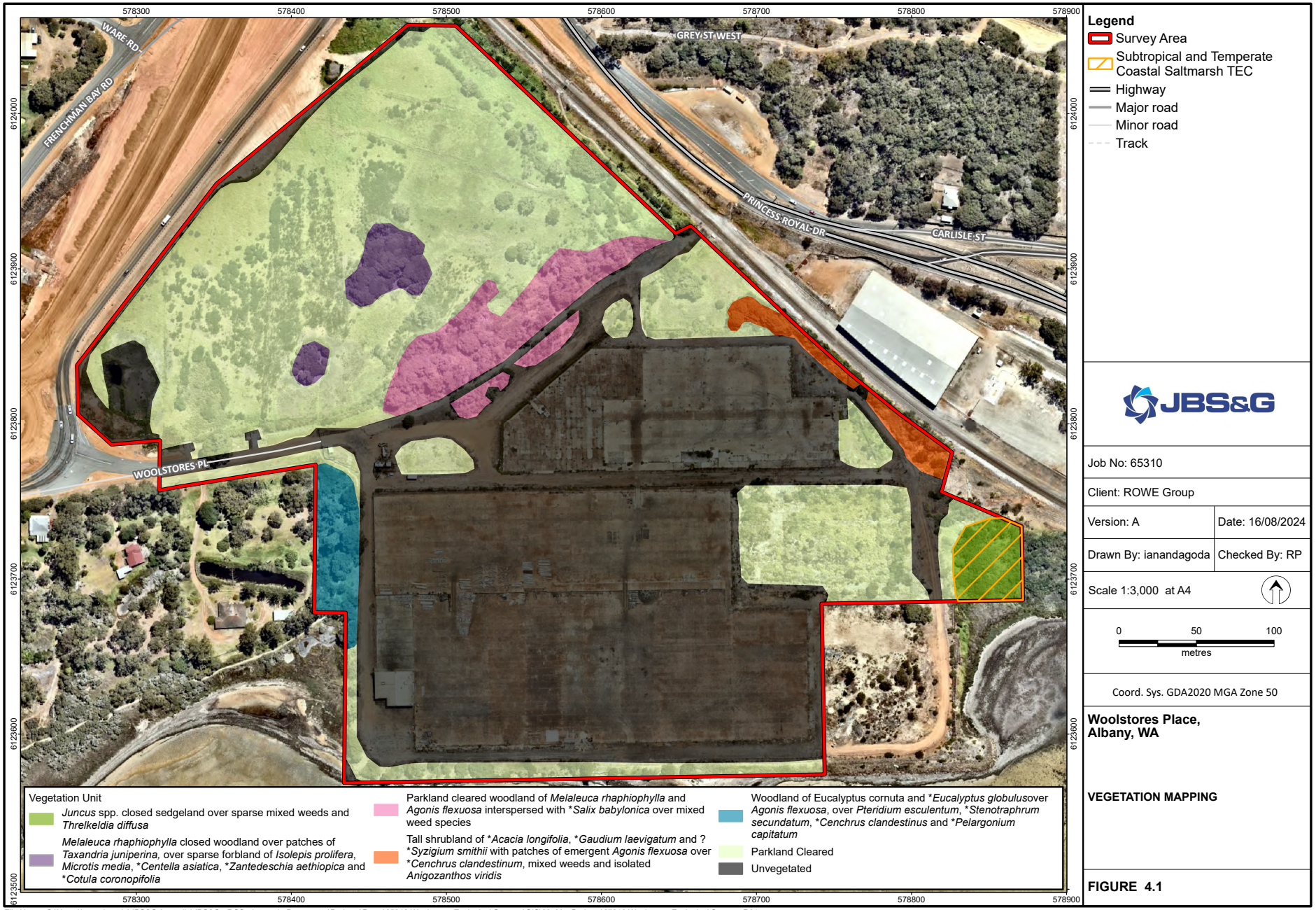

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4.2.2 Vegetation Condition

The majority of the Survey Area was in Completely Degraded condition due to historic clearing (Table 4.2). These areas were covered by weeds, concrete and hardstand.

Table 4.2 Vegetation condition in the Survey Area

Condition	Area (ha)	Proportion of Survey Area
Completely Degraded	16.29	97.02%
Good	0.03	0.16%
Very Good	0.47	2.82%
Grand Total	**16.79**	

4.2.3 Significant Vegetation

4.2.3.1 Conservation Dependent Vegetation

Vegetation in the Juncus closed sedgeland was consistent with the key diagnostic criteria for the TEC *Subtropical and Temperate Coastal Saltmarsh* (Table 4.3). This patch is contiguous with saltmarsh vegetation outside the Survey Area, amounting to approximately 1 ha (greater than the minimum patch size of 0.4 ha). The patch contained <50% weeds, meeting the minimum condition thresholds.

Table 4.3 Key Diagnostic Criteria for the Subtropical and Temperate Coastal Saltmarsh Ecological Community

Diagnostic Criteria	Site features	Met/Not Net
Occurs south of 23° 37' S latitude - from the central Mackay coast on the east coast of Australia, southerly around to Shark Bay on the west coast of Australia (26° latitude) and including the Tasmanian coast and islands within the above range.	The site occurs at 35° south.	Met
Occurs on the coastal margin, along estuaries and coastal embayments and on low wave energy coasts.	The site occurs on the shore of the Princess Royal Harbour, a coastal embayment in King George Sound.	Met
Occurs on places with at least some tidal connection, including rarely-inundated supratidal areas, intermittently opened or closed lagoons, and groundwater tidal influences, but not areas receiving only aerosol spray.	The site had visual indicators of tide activity (low and high tide lines).	Met
Occurs on sandy or muddy substrate and may include coastal clay pans (and the like).	The site had deep muds.	Met
Consists of dense to patchy areas of characteristic coastal saltmarsh plant species (i.e. salt tolerant herbs, succulent shrubs or grasses, which may also include bare sediment as part of the mosaic) and.	The site was dominated by *Juncus* spp. and *Threlkeldia diffusa* and *Tecticornia ?indica* was present adjacent.	Met
Proportional cover by tree canopy such as mangroves, Melaleucas or Casuarinas is not greater than 50%, nor is proportional ground cover by seagrass greater than 50%.	No tree cover was present.	Met

4.2.3.2 Groundwater Dependent Vegetation

Much of the Survey Area would have had historic dependence on groundwater due to the high water table in the Survey Area and its location in the riparian zone for Princess Royal Harbor, however, few native vegetation remnants remain on the site. Saltmarsh in the Survey Area and *Melaleuca* woodland should both be treated as having groundwater dependence.

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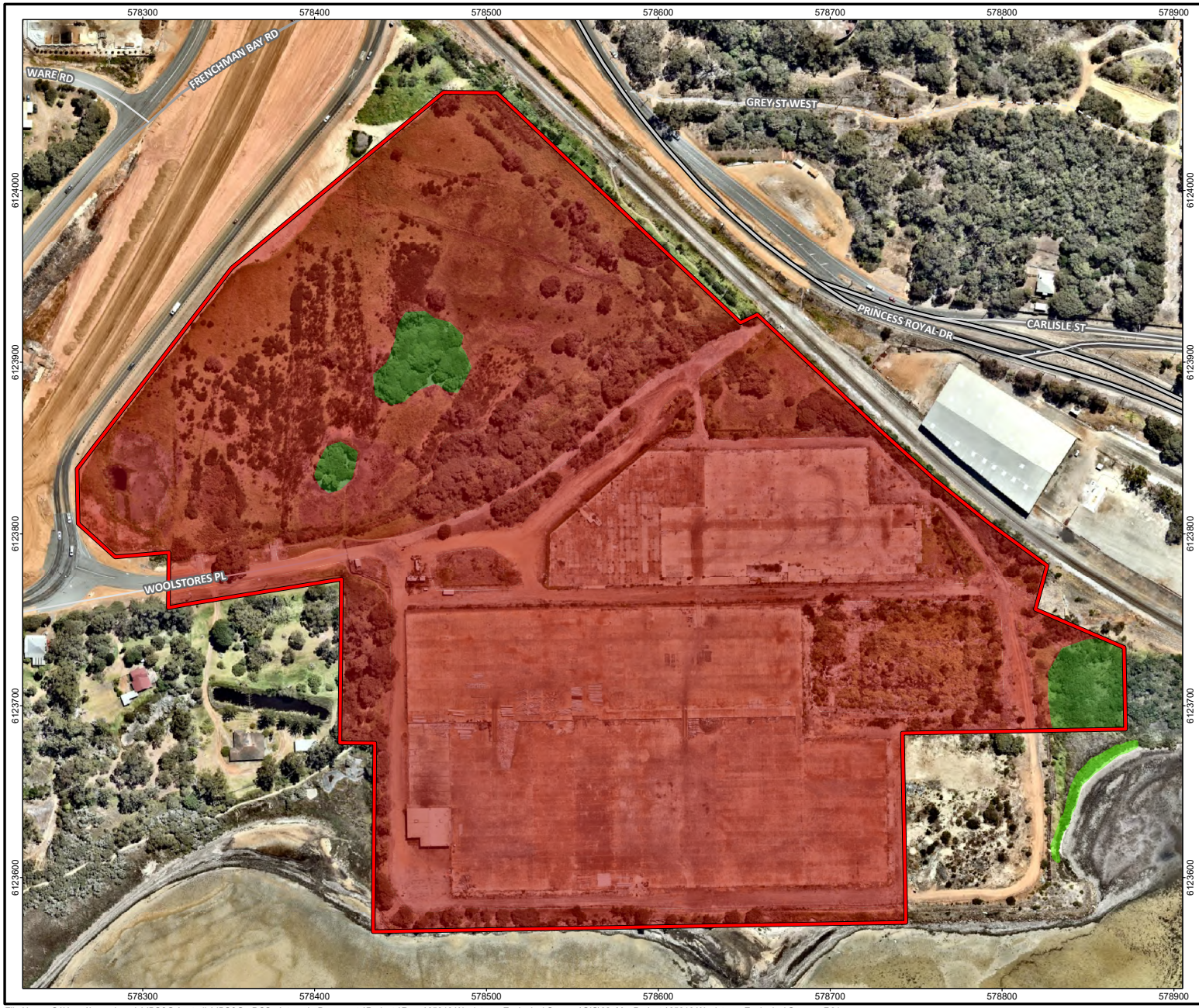

Legend

- Survey Area
- Vegetation condition
  - Very Good
  - Good
  - Completely Degraded
- Highway
- Major road
- Minor road
- Track

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VEGETATION CONDITION

FIGURE 4.2

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4.3 Fauna

4.3.1 Fauna Assemblage

Seventy three fauna taxa were recorded during the Survey including 57 from within the Survey Area and additional bird sightings adjacent (Appendix F). The following taxa were observed during the survey (Table 4.4, Plate 5, Figure 4.3).

Table 4.4 Fauna taxa observed during the survey

Taxon	Status	Observation
Amphibians		
Slender Tree Frog (*Litoria adelaidensis)*		Heard
Motorbike Frog (*Litoria moorei*)		Heard
Rattling Froglet (*Crinia glauerti*)		Heard
Reptiles		
King's Skink (*Egernia kingii*)		Camera trap
Mammals		
Quenda, Southern Brown Bandicoot (*Isoodon obesulus*)	P4	Camera trap, diggings, seen
Western Ringtail Possum (*Pseudocheirus occidentalis*)	CE	Dreys, scat
Western Grey Kangaroo (*Macropus fuliginosus*)		Seen
Dog (*Canis lupus*)	Introduced	Seen
Cat (*Felis catus*)	Introduced	Camera trap
Rabbit (*Oryctolagus cuniculus*)	Introduced	Camera trap
Black Rat (*Rattus rattus*)	Introduced	Camera trap
Birds		
Acanthiza chrysorrhoa (Yellow-rumped Thornbill)		Seen
Actitis hypoleucos (Common Sandpiper)	MI	Seen adjacent
Anas castanea (Chestnut Teal)		Seen
Anas superciliosa (Pacific Black Duck)		Seen
Anhinga melanogaster (Darter)		Seen adjacent
Anthochaera carunculata (Red Wattlebird)		Seen
Ardea alba (Eastern Great Egret)	MI	Seen adjacent
Barnardius zonarius (Australian Ringneck)		Seen
Cacomantis flabelliformis (Fan-Tailed Cuckoo)		Seen
Calidris ruficollis (Red-necked Stint)	MI	Seen
Calyptorhynchus banksii (Red-tailed Black-Cockatoo)	VU	Heard adjacent
Chalcites lucidus (Shining Bronze Cuckoo)		Seen
Charadrius ruficapillus (Red-capped Plover)		Seen
Chenonetta jubata (Australian Wood Duck)		Seen
Circus approximans (Swamp Harrier)		Seen
Colluricincla harmonica (Grey Shrike-thrush)		Seen
Columba livia (Feral Pigeon)		Seen
Coracina novaehollandiae (Black-faced Cuckoo-shrike)		Seen

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Taxon	Status	Observation
Corvus coronoides (Australian Raven)		Seen
Cracticus tibicen (Australian Magpie)		Seen
Cracticus torquatus (Grey Butcherbird)		Seen
Egretta novaehollandiae (White-faced Heron)		Seen
Eolophus roseicapillus (Galah)		Seen
Gavicalis virescens (Singing Honeyeater)		Seen
Glossopsitta porphyrocephala (Purple-crowned Lorikeet)		Seen
Grallina cyanoleuca (Magpie-lark)		Seen
Haematopus longirostris (Pied Oystercatcher)		Seen
Haliastur sphenurus (Whistling Kite)		Seen
Hirundo neoxena (Welcome Swallow)		Seen
Hydroprogne caspia (Caspian Tern)	MI	Seen adjacent
Larus novaehollandiae (Silver Gull)		Seen
Larus pacificus (Pacific Gull)	MI	Seen adjacent
Lichmera indistincta (Brown Honeyeater)		Seen
Malurus elegans (Red-winged Fairywren)		Seen
Malurus splendens (Splendid Fairy-wren)		Seen
Pachycephala pectoralis (Golden Whistler)		Seen
Pandion haliaetus (Eastern Osprey)	MI	Seen
Pardalotus punctatus (Spotted Pardalote)		Seen
Pelecanus conspicillatus (Australian Pelican)		Seen adjacent
Petrochelidon ariel (Fairy Martin)		Seen
Phalacrocorax carbo (Great Cormorant)		Seen adjacent
Phalacrocorax melanoleucos (Little Pied Cormorant)		Seen adjacent
Phalacrocorax sulcirostris (Little Black Cormorant)		Seen adjacent
Phalacrocorax varius (Pied Cormorant)		Seen adjacent
Phaps chalcoptera (Common Bronzewing)		Seen
Phylidonyris novaehollandiae (New Holland Honeyeater)		Seen
Platalea flavipes (Yellow-billed Spoonbill)		Seen adjacent
Platycercus icterotis (Western Rosella)		Seen
Pluvialis squatarola (Grey Plover)	MI	Seen adjacent
Poodytes gramineus (Little Grassbird)		Seen adjacent
Porphyrio porphyrio (Purple Swamphen)		Seen
Purpureicephalus spurius (Red-capped Parrot)		Seen
Rhipidura albiscapa (Grey Fantail)		Seen
Rhipidura leucophrys (Willie Wagtail)		Seen
Sericornis maculatus (Spotted Scrubwren)		Seen
Smicrornis brevirostris (Weebill)		Seen
Stagonopleura oculata (Red-eared Firetail)		Seen
Sternula nereis (Fairy Tern)	VU/MI	Seen adjacent

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Taxon	Status	Observation
Stipiturus malachurus (Southern Emu-wren)		Seen
Thalasseus bergii (Crested Tern)	MI	Seen adjacent
Threskiornis moluuca (Australian White Ibis)		Seen
Zosterops lateralis (Silvereye)	MI	Seen

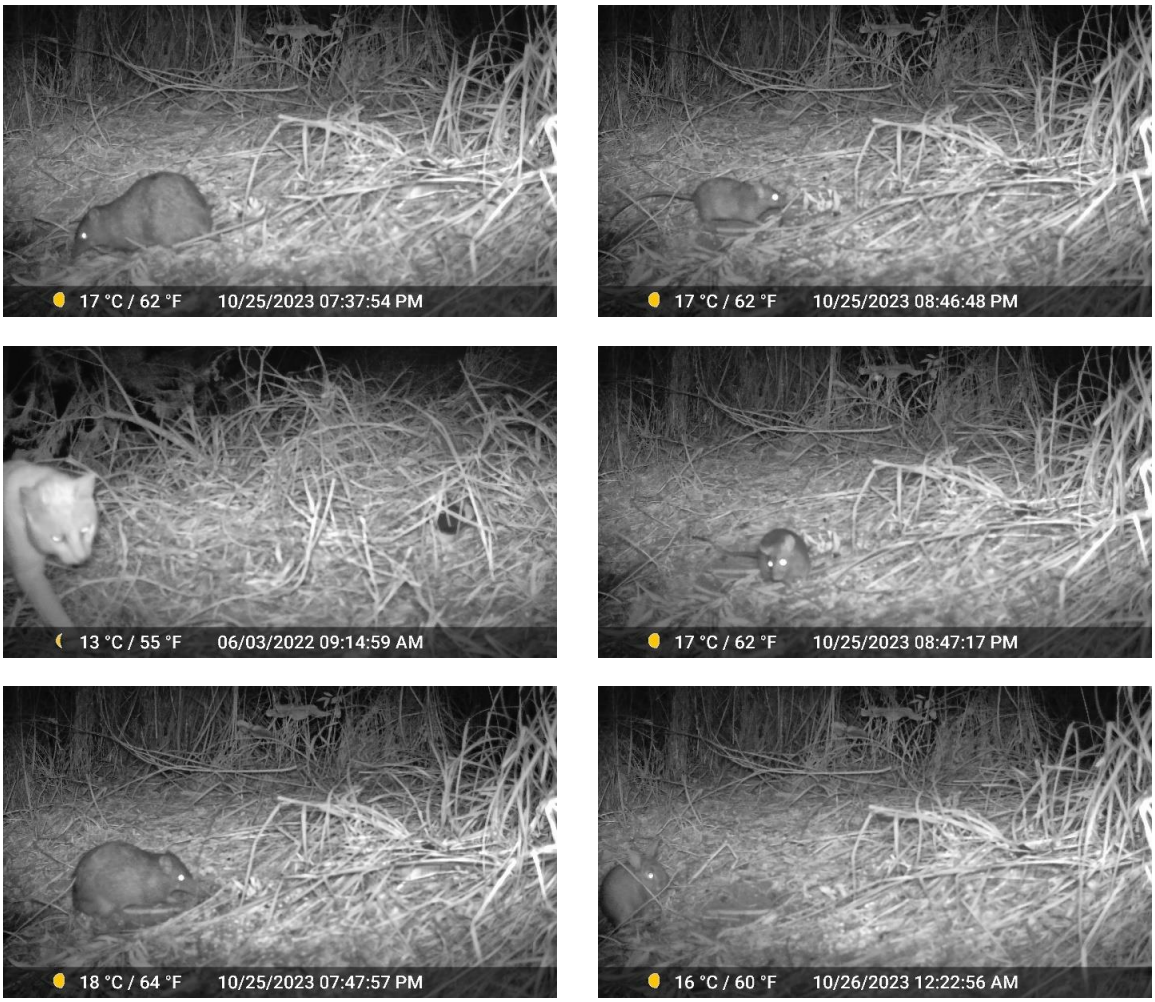

Plate 5 Camera trap images (note, one camera had the incorrect date and time set)

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Legend

- Survey Area
- Significant fauna
  - T
  - P4
- Highway
- Major road
- Minor road
- Track

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Scale 1:3,000 at A4

0 50 100
metres

Coord. Sys. GDA2020 MGA Zone 50

Woolstores Place, Albany, WA

SIGNIFICANT FAUNA

FIGURE 4.3

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4.3.2 Fauna Habitat

Six fauna habitats were identified within the Survey Area (Table 4.5, Table 4.6, Figure 4.4). Most of these were highly modified but still retained some value to fauna as evidenced by fauna observed during the survey. Approximately 48.65% of the Survey Area was occupied by tracks, hardstand or concrete and provided little to no value for fauna.

Table 4.5 Fauna habitats in the Survey Area

Habitat type	Area (ha)	Proportion of Survey Area
Damplands 1	0.62	3.68%
Damplands 2	4.62	27.55%
Disturbed	2.22	13.27%
Drainage Line	0.78	4.67%
Freshwater and Brackish Wetlands	0.36	2.13%
Mudflats and Shoreline	0.01	0.05%
Unvegetated	8.16	48.65%
Total	**16.77**	

Table 4.6 Fauna habitat descriptions

Landform Vegetation	Inside survey area	Comments	Photo
Damplands 1 Melaleuca preissiana and Peppermint Woodland	Yes	Habitat for Western Ringtail Possum and Quenda	
Damplands 2 Mixed native and introduced species	Yes	Quenda occur	

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Landform Vegetation	Inside survey area	Comments	Photo
Disturbed Pasture, introduced weeds and native species	Yes	Quenda occur	
Drainage line Yate and Peppermint thickets over sedges and mixed shrubs	Yes	Habitat for Western Ringtail Possum and Quenda	
Freshwater and Brackish Wetlands Reeds / Sedges and fringing riparian	Yes	Waterbirds and frogs, Chestnut Teal breeding	

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Landform Vegetation	Inside survey area	Comments	Photo
Mudflats and shoreline None	Minimal	Wader habitat	

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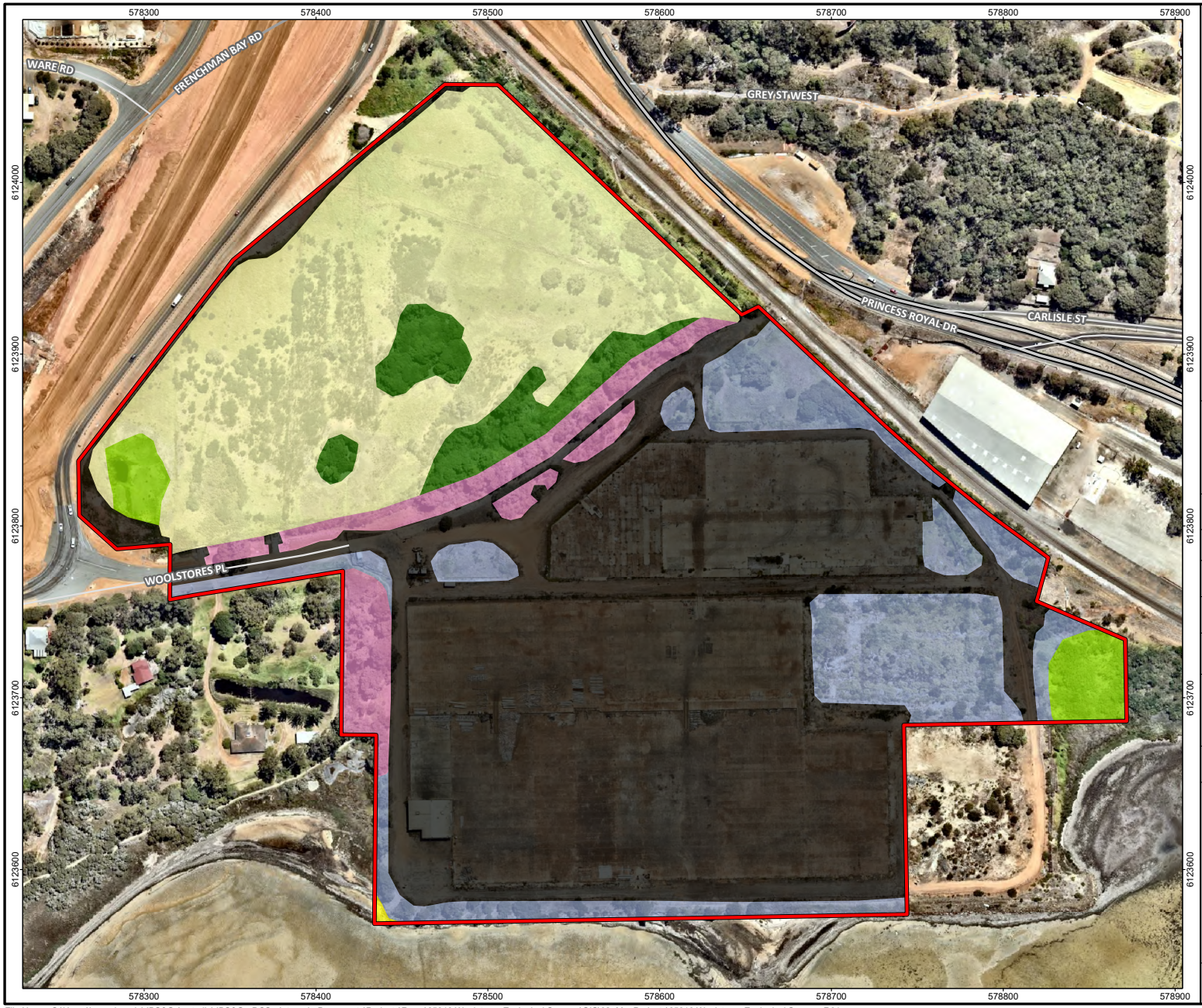

Legend

- Survey Area

Fauna habitat

- Damplands 1
- Damplands 2
- Disturbed
- Drainage Line
- Freshwater and Brackish Wetlands
- Mudflats and Shoreline
- Unvegetated

- Highway
- Major road
- Minor road
- Track

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Job No: 65310

Client: ROWE Group

Version: A	Date: 16/08/2024
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metres

Coord. Sys. GDA2020 MGA Zone 50

Woolstores Place, Albany, WA

FAUNA HABITAT

FIGURE 4.4

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5. Discussion

5.1 Flora

Native species diversity in the Survey Area was extremely poor (16 taxa) due to historic clearing and the presence of invasive weed species at high densities.

No flora species listed at a State or Commonwealth level were present in the Survey Area. Although the high densities of weeds would have made listed taxa difficult to detect, it is unlikely that any are present since the site has been historically cleared and likely grazed.

"Significant" flora in the Survey Area were restricted to saltmarsh taxa and *Melaleuca* species which are groundwater dependent.

5.2 Vegetation

The Survey Area contained 0.48 ha of intact native vegetation, with the remaining vegetation units being degraded to the extent that they no longer represent a community of indigenous species native to the area. Instead these areas were parkland cleared, with no more than three native flora taxa present.

Vegetation at the eastern end of the Survey Area was consistent with the TEC *Subtropical and Temperate Coastal Saltmarsh*, listed as Vulnerable under the EPBC Act and Priority 3 by DBCA. Dense cover of Juncus has resulted in low native species richness in the patch, but also low levels of weed invasion.

Saltmarsh in the Survey Area is at risk from anthropogenic changes in sea level, with steep embankments preventing saltmarsh from retreating landward as sea levels rise. Other risks to the patch include weed invasion, acid sulfate soils, stormwater drainage, reinforcement of embankments for development and pedestrian traffic.

5.3 Fauna

Two fauna taxa listed at a State or Commonwealth level were identified within the Survey Area, Western Ringtail Possum and Quenda. One additional listed taxon, the Forest Red-tailed Black Cockatoo was heard outside the Survey Area and ten bird species listed as Migratory and/or under an International Agreement were recorded in or adjacent to the Survey Area. One of these, the Fairy Tern is also listed as Vulnerable under the EPBC Act.

Western Ringtail Possum (*Pseudocheirus occidentalis*)

The Western Ringtail Possum is a small, arboreal mammal whose distribution is restricted to the South-west of Western Australia. It inhabits coastal and near coastal Peppermint-Tuart, Jarrah-Marri, Sheoak and eucalypt woodland and mallee woodland (preferably closed-canopy) (DPaW, 2017).

Numerous Peppermint trees occurred within the Survey Area and dreys were found in two locations, with additional dreys found south-west along the coastline. Numerous scat were found below shrubs growing along the top of the embankment on the southern side of the reclaimed land, as well as in other areas of the Survey Area.

Quenda/Southern Brown Bandicoot (*Isoodon obesulus*)

The Quenda/Southern Brown Bandicoot is a small, ground-dwelling mammal which ranges from New South Wales to Western Australia, predominantly in coastal and near-coastal areas. It inhabits forest, woodland, shrub and heath communities, typically with dense, healthy vegetation in the lower stratum (van Dyck, et al., 2013). Most habitats within the Survey Area provide suitable habitat for Quenda.

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Most Quenda observations were made in and around thickly-grassed, elevated areas of the site.

Forest Red-tailed Black Cockatoo (*Calyptorhychus banksii naso*)

The Forest Red-tailed Black Cockatoo is a large bird endemic to the South-west of Western Australia. It relies upon Marri, Jarrah, Wandoo, Tuart and Karri woodlands and forests, where they feed primarily on Marri and Jarrah (Johnstone & Kirkby, 2011).

EPBC Act referral guidelines for black cockatoos (DAWE, 2022) describe referral triggers including the loss of greater than 1 ha of high-quality foraging habitat or the loss of one or more suitable nesting trees. To qualify as high-quality foraging habitat for the Forest Red-tailed Black Cockatoo, a site must contain Jarrah or Marri woodland/forest, be on the edge of Karri forest or contain Wandoo or Blackbutt (DAWE, 2022). None of this habitat was present within the Survey Area.

Fairy Tern

The Fairy Tern is a is a small tern occurring along Australia's south coast. It inhabits coastal waters, bays, inlets, saline or brackish lakes, saltfields, sewage ponds near coast (Pizzey & Knight, 2012). It was not seen inside the Survey Area but was seen foraging in the Princess Royal Harbour. Within the Survey Area, saline or brackish lakes may provide habitat for Fairy Terns.

Migratory Birds

Although numerous birds listed as Migratory under the EPBC Act and/or subject to International Agreements were identified within or adjacent to the Survey Area, most of the Survey Area does not provide suitable habitat for these species, all of which were observed in the Princess Royal Harbor or immediately adjacent. Within the Survey Area, saline or brackish lakes may provide occasional habitat for these species and they may utilise the rocky embankment on the southern shoreline.

5.4 Fauna Habitat

The most significant fauna habitat identified by the Survey was Western Ringtail Possum habitat (Drainage Line and Damplands 1). This occupied 8.35 % (1.4 ha) of the Survey Area. Western Ringtail Possums are listed as Critically Endangered under the EPBC Act and the BC Act. Twelve dreys were present in the Survey Area and numerous scat, suggesting that the Survey Area is well used.

Quenda, King Skink and three frog species were also resident and are unlikely to be easy to relocate during clearing as they hide under vegetation.

The mudflats adjacent to the Survey Area appear important for waders with close to 100 Red-necked Stints, a migratory species subject to International Agreements (EPBC Act, Bonn, CAMBA, JAMBA, ROKAMBA), recorded adjacent to the Survey Area. Greater Sand Plover, Red Knot, Ruddy Turnstone, Pacific Golden Plover, Bar-tailed Godwit and Great Knot were all recorded nearby within 5 km (Little Grove-Rushy Point) during September and October 2023 (Cornell University, 2023).

5.5 Survey Adequacy

Given the land-use history and predominantly cleared nature of the Survey Area, a Reconnaissance flora and vegetation survey in combination with Targeted flora survey and Basic fauna survey is considered adequate for this site. Although additional effort might find additional flora taxa, the vast majority of these would be introduced taxa.

The Survey Area did not contain significant microhabitats typical of Short Range Endemic fauna. Main's Assassin Spider was the only listed invertebrate species which might occur in the Survey Area as this inhabits sedges and low shrubs in dense coastal or near-coastal groves of Peppermint, consistent with the Damplands 1 and Drainage Line fauna habitats. Other dense vegetation in the Survey Area may also provide habitat. Main's

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Assassin Spider was collected approximately 3.5 km from the Survey Area in 1983. There were no other nearby records of this taxon.

The very small lake in the Survey Area has potential to host threatened freshwater fish species, which have been recorded within 5 km of the Survey Area.

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6. Conclusion

The key results and outcomes of the flora and vegetation survey were:

- Twenty-seven native flora species were recorded within the Survey Area;
- Fifty-three introduced flora species were recorded within the Survey Area, two of which were Declared Pests;
- No listed (conservation significant) flora taxa were identified by the survey;
- Most of the undeveloped portion of the Survey Area was a wetland (6.38 ha or 38.04% of the Survey Area);
- One EPBC Act listed threatened ecological community was identified by the survey, *Subtropical and Temperate Coastal Saltmarsh,* occupying 0.22 ha (1.3 % of the Survey Area). Access to this community was limited due to deep mud;
- One predominantly native vegetation type and three degraded vegetation units containing few native species were mapped across the Survey Area, ranging in condition from Very Good to Completely Degraded, with 16.29 ha (97.02 % of the Survey Area) being in Completely Degraded condition; and
- Vegetation units within the Survey Area are likely to be groundwater dependent.

The key results and outcomes of the fauna survey were:

- Sixty-nine native or migratory fauna were recorded within and adjacent to the Survey Area, including three frogs, one lizard, three mammals and 62 birds;
- Four introduced fauna taxa were recorded within the Survey Area;
- Thirteen listed fauna taxa were observed during the survey including ten migratory, one Critically Endangered, two Vulnerable and one Priority 4 fauna taxa.
- The Survey Area contained approximately 1.40 ha (8.35 % of the Survey Area) of Western Ringtail Possum (Critically Endangered) habitat and was utilised by Western Ringtail Possum, with both dreys and scat found;
- The Survey Area contained approximately 8.24 ha (49.14 % of the Survey Area) of Quenda habitat and was utilised by Quenda, with camera trap sightings;
- The adjacent mudflats which were outside the Survey Area are likely to be a regionally significant habitat for waterbirds, including Fairy Terns (listed as Vulnerable and Migratory under the EPBC Act);
- Potential habitat for listed fish species was present (Freshwater and Brackish wetlands), but targeted survey for these was outside the scope of this survey;
- Potential habitat for the Mains Assassin Spider was present (Damplands 1, Damplands 2, Drainage Line and riparian zones of Freshwater and Brackish Wetlands), but targeted survey for these was outside the scope of this survey; and
- No habitat for threatened black cockatoo species was identified, although the Forest Red-tailed Black Cockatoo (listed as Vulnerable under the EPBC Act) was heard nearby.

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7. Limitations

Scope of services

This report ("the report") has been prepared by JBS&G in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and JBS&G. In some circumstances, a range of factors such as time, budget, access and/or site disturbance constraints may have limited the scope of services. This report is strictly limited to the matters stated in it and is not to be read as extending, by implication, to any other matter in connection with the matters addressed in it.

Reliance on data

In preparing the report, JBS&G has relied upon data and other information provided by the Client and other individuals and organisations, most of which are referred to in the report ("the data"). Except as otherwise expressly stated in the report, JBS&G has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("conclusions") are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. JBS&G has also not attempted to determine whether any material matter has been omitted from the data. JBS&G will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to JBS&G. The making of any assumption does not imply that JBS&G has made any enquiry to verify the correctness of that assumption.

The report is based on conditions encountered and information received at the time of preparation of this report or the time that site investigations were carried out. JBS&G disclaims responsibility for any changes that may have occurred after this time. This report and any legal issues arising from it are governed by and construed in accordance with the law as at the date of this report.

Environmental conclusions

Within the limitations imposed by the scope of services, the preparation of this report has been undertaken and performed in a professional manner, in accordance with generally accepted environmental consulting practices. No other warranty, whether express or implied, is made, including to any third parties, and no liability will be accepted for use or interpretation of this report by any third party.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

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Appendix A Conservation Significant Flora and Ecological Community Definitions

Biodiversity Conservation Act 2016 (Western Australia)

Threatened, Extinct and Specially Protected Fauna and Flora

Under the Western Australian Biodiversity Conservation Act 2016, Threatened, Extinct and Specially Protected fauna or flora are species which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such.

A.1 Western Australian Threatened, Extinct and Specially Protected fauna and flora categories

Code	Conservation Category
Threatened Species (T)	
Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act). Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna. Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threatened Flora. The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.	
CR	**Critically Endangered Species** Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.
EN	**Endangered Species** Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for endangered flora.
VU	**Vulnerable Species** Threatened species considered to be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora.
Extinct species (EX) Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.	
EX	**Extinct Species** Species where "there is no reasonable doubt that the last member of the species has died", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act). Published as presumed extinct under schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for extinct flora.
EW	**Extinct in the Wild Species** Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).

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Code	Conservation Category
	Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.
Specially Protected Species	Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection. Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.
MI	**Migratory Species** Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act). Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species. Published as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018.*
CD	**Species of special conservation interest (conservation dependent fauna)** Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act). Published as conservation dependent fauna under schedule 6 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018.*
OS	**Other specially protected species** Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act). Published as other specially protected fauna under schedule 7 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.
Priority species (P)	Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations
P1	**Priority 1: Poorly-known species** Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
P2	**Priority 2: Poorly-known species** Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
P3	**Priority 3: Poorly-known species**

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Code	Conservation Category
	Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
P4	**Priority 4: Rare, Near Threatened and other species in need of monitoring** Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Threatened and Priority Ecological Communities

Division 2 of the *Biodiversity Conservation Act 2016* (BC Act) provides for the statutory listing of threatened ecological communities (TECs) by the Minister.

A.2 Western Australian listed Threatened Ecological Community categories

Code	Conservation Category
PD	**Presumed Totally Destroyed (PD)** An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future. An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies (a or b) Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats or All occurrences recorded within the last 50 years have since been destroyed.
CR	**Critically Endangered Communities** An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated. An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (a, b or c): a. The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii): i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years); ii) modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated. b. Current distribution is limited, and one or more of the following apply (i, ii or iii): i. geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years); ii. there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes; iii. there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes. c. The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).
EN	**Endangered Communities** An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.

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Code	Conservation Category
	An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (a, b, or c): a. The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply (i or ii): i. the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years); ii. modification throughout its range is continuing such that in the short-term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated. b. Current distribution is limited, and one or more of the following apply (i, ii or iii): i. geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years); ii. there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes; iii. there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes. c. The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).
VU	**Vulnerable Communities** An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range. An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium (within approximately 50 years) to long-term future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (a, b or c): a. The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated. b. The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations. c. The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long-term future because of existing or impending threatening processes.

Priority Ecological Communities

Priority is not a listing category under the BC Act. The Priority Ecological Communities list is maintained by Department of Biodiversity, Conservation and Attractions and is published on the department's website.

All fauna and flora that may be present in an ecological community are protected in WA following the provisions in Part 10 of the BC Act. The protection applies even when these species occur in an ecological community that is not listed as threatened, and regardless of land tenure (State managed land (Crown land), private land, or Commonwealth land).

Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community List under priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community. Ecological communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

A.3 Western Australian listed Priority Ecological Community categories

Code	Conservation Category
P1	**Priority One: Poorly-known ecological communities**

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Code	Conservation Category
	Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤ 5 occurrences or a total area of ≤ 100 ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
P2	**Priority Two: Poorly-known ecological communities** Communities that are known from few occurrences with a restricted distribution (generally ≤ 10 occurrences or a total area of ≤ 200 ha). At least some occurrences are not believed to be under immediate threat (within approximately 10 years) of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
P3	**Priority Three: Poorly known ecological communities** Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them. This category includes three sub-categories: a. Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation. b. Communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately 10 years). c. Communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change etc.
P4	**Priority Four: Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list.** These communities require regular monitoring. a. Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands. b. Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for a higher threat category. c. Ecological communities that have been removed from the list of threatened communities during the past five years.
P5	**Priority Five: Conservation Dependent ecological communities** Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)

Threatened Species

Threatened fauna and flora may be listed under Section 178 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in any one of the following categories.

A.4 Commonwealth listed Threatened Species categories

Code	Conservation Category
EX	**Extinct Species** A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
EW	**Extinct in the Wild Species** A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time: a. it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or

Code	Conservation Category
	b. it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, d
CR	**Critically Endangered Species** A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
EN	**Endangered Species** A native species is eligible to be included in the endangered category at a particular time if, at that time: a. it is not critically endangered; and b. it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
VU	**Vulnerable Species** A native species is eligible to be included in the vulnerable category at a particular time if, at that time: a. it is not critically endangered or endangered; and b. it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
CD	**Conservation Dependent Species** A native species is eligible to be included in the conservation dependent category at a particular time if, at that time: a. the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or b. the following subparagraphs are satisfied: i. the species is a species of fish; ii. the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; iii. the plan of management is in force under a law of the Commonwealth or of a State or Territory; iv. cessation of the plan of management would adversely affect the conservation status of the species.

Threatened Ecological Communities

Threatened Ecological Communities may be listed under Section 181 of the EPBC Act in any one of the following categories.

A.5 Commonwealth listed Threatened Ecological Community categories

Code	Conservation Category
CR	**Critically Endangered Communities** An ecological community is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
EN	**Endangered Communities** An ecological community is eligible to be included in the endangered category at a particular time if, at that time: a. it is not critically endangered; and b. it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
VU	**Vulnerable Communities** An ecological community is eligible to be included in the vulnerable category at a particular time if, at that time: a. it is not critically endangered nor endangered; and b. it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.

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Appendix B Conservation Significant Flora and Fauna Likelihood Assessment

Table B.6 Conservation significant flora identified by database searches and their likelihood of presence in the Survey Area

Taxon FAMILY	State	Cth	Description	Likelihood of Occurrence	Reassessment Post-field
Acacia ataxiphylla subsp. *ataxiphylla* FABACEAE	P3	Not listed	Prostrate, sprawling shrub, 0.15-0.5 m high, to 1 m wide. Fl. yellow, Nov to Dec or Jan. Gravelly clay loam, white/grey sand. Flats, roadsides.	Likely based on nearby records and presence of preferred habitat	Unlikely based on habitat preferences
Acacia prismifolia FABACEAE	CR	EX	Shrub, 0.15-0.5 m high. Rocky slopes.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Adenanthos x cunninghamii PROTEACEAE	P4	Not listed	Erect open shrub, 1-3 m high. Fl. red/pink-red, Mar or Sep to Oct. Grey sand. Coastal dunes & sandplains.	Likely based on nearby records and presence of preferred habitat	Unlikely based on habitat preferences
Agrostocrinum scabrum subsp. *littorale* HEMEROCALLIDACEAE	P2	Not listed	Rhizomatous, perennial, herb, to 0.15 m high. Fl. blue, Oct to Nov. Shallow granite loams. Coastal slopes.	Likely based on nearby records and presence of preferred habitat	Unlikely based on habitat preferences
Andersonia auriculata ERICACEAE	P3	Not listed	Erect or spreading shrub, 0.1-0.3(-0.5) m high. Fl. white & blue, Apr to Oct. Grey or peaty sand, often over laterite. Swampy areas, granite outcrops.	Possible based on habitat preferences	Unlikely based on habitat preferences
Andersonia setifolia ERICACEAE	P3	Not listed	Decumbent to erect, cushion-forming shrub, 0.05-0.15 m high. Fl. red/white, Jun to Oct. Sandy & gravelly soils. Hillslopes & breakaways.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Andersonia sp. Jamesii (J. Liddelow 84) ERICACEAE	P4	Not listed	No description available	Possible based on regional distribution	Unlikely based on habitat preferences
Anzybas abditus ORCHIDACEAE	P3	Not listed	Tuberous herb to 0.02 m high. Fl. Oct to early-Nov. Peaty soils in seasonally wet flats and drainage lines.	Possible based on habitat preferences	Possible based on habitat preferences Could have been missed among dense vegetation

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Taxon FAMILY	State	Cth	Description	Likelihood of Occurrence	Reassessment Post-field
Asplenium decurrens ASPLENIACEAE	P4	Not listed	Rhizomatous fern growing to 0.6 m high. Sheltered sites close to the sea.	Possible based on habitat preferences	Possible based on habitat preferences Could have been missed among dense vegetation
Austrostipa mundula POACEAE	P3	Not listed	Perennial grass to 0.6 m high.	Possible based on regional distribution	Possible based on regional distribution Could have been missed among dense vegetation
Banksia brownii PROTEACEAE	CR	CR	Bushy, non-lignotuberous shrub or tree (small), 1-6 m high. Fl. cream & brown/orange-red, Mar to Jul. Sand over laterite, gravel, loam over granite. In gullies.	Likely based on nearby records and presence of preferred habitat	Unlikely based on habitat preferences.
Banksia goodii PROTEACEAE	VU	VU	Lignotuberous, prostrate shrub, ca 0.2 m high. Fl. orange-brown-red, May or Nov. White or grey sand over laterite.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Banksia seneciifolia PROTEACEAE	P4	Not listed	Columnar,non-lignotuberous shrub, 0.6-1 m high. Fl. cream-yellow-brown, Jun or Aug. Sandy loam, sand. Rocky hillslopes.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Banksia serra PROTEACEAE	P4	Not listed	Columnar,non-lignotuberous shrub, 0.6-1 m high. Fl. cream-yellow-brown, Jun or Aug. Sandy loam, sand. Rocky hillslopes.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Banksia verticillata PROTEACEAE	CR	VU	Non-lignotuberous shrub or tree (rarely), 1.3-6 m high. Fl. yellow-orange, Jan to Apr. Sandy loam. On or beside granite outcrops.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Boronia crassipes RUTACEAE	P3	Not listed	Erect, spindly shrub, 0.5-2 m high. Fl. red-pink, Aug to Sep. Sand, peaty sand. Winter-wet swamps, creeklines.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Smaller plants could have been missed among dense vegetation
Bossiaea sp. Mt Frankland (L. Graham 2174) FABACEAE	P2	Not listed	No description available.	Possible based on regional distribution	Possible based on regional distribution Smaller plants could have been missed among dense vegetation

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Taxon FAMILY	State	Cth	Description	Likelihood of Occurrence	Reassessment Post-field
Caladenia evanescens ORCHIDACEAE	P1	Not listed	Tuberous, perennial, herb, 0.15-0.2 m high. Fl. green-cream-yellow, Nov. Sand. Consolidated sand dunes.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Caladenia granitora ORCHIDACEAE	EN	EN	Tuberous, perennial, herb, 0.2-0.35 m high. Fl. cream & white & red, Oct to Nov. Shallow soil crevices on granite. Coastal areas.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Caladenia harringtoniae ORCHIDACEAE	VU	VU	Tuberous, perennial, herb, 0.2-0.4 m high. Fl. pink, Oct to Nov. Sandy loam. Winter-wet flats, margins of lakes, creeklines, granite outcrops.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Could have been missed among dense vegetation
Calandrinia sp. Torndirrup (S.D. Hopper et al. SDH 8712) MONTIACEAE	P2	Not listed	No description available.	Possible based on regional distribution	Possible based on regional distribution Could have been missed among dense vegetation
Calectasia cyanea DASYPOGONACEAE	CR	CR	Rhizomatous, clump forming, woody perennial, herb, 0.1-0.6 m high, to 0.3 m wide. Fl. blue/purple, Jun to Oct. White, grey or yellow sand, gravel.	Likely based on nearby records and presence of preferred habitat	Unlikely based on habitat preferences
Caustis sp. Boyanup (G.S. McCutcheon 1706) CYPERACEAE	P3	Not listed	Rhizomatous, clumped perennial, grass-like or herb (sedge), 0.7-1 m high. White or grey sand.	Possible based on habitat preferences	Unlikely based on habitat preferences
Chordifex abortivus RESTIONACEAE	VU	EN	Rhizomatous, erect perennial, herb, to 0.5 m high. Fl. brown, Sep to Oct. Sand. Low rises & undulating areas.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Chorizema carinatum FABACEAE	P3	Not listed	Erect or spreading shrub, 0.1-0.6 m high. Fl. yellow, Oct to Dec. Sand, sandy clay.	Likely based on nearby records and presence of preferred habitat	Unlikely based on habitat preferences
Conospermum quadripetalum PROTEACEAE	CR	Not listed	Diffuse, straggly shrub, 0.3-1 m high. Fl. blue/white, Sep to Nov. Sandy clay, grey sand. Flats behind coastal hills.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Smaller plants could have been missed among dense vegetation

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Taxon FAMILY	State	Cth	Description	Likelihood of Occurrence	Reassessment Post-field
Conospermum spectabile PROTEACEAE	P2	Not listed	Erect, compact shrub, 0.5-0.8 m high. Fl. white & blue, Oct to Nov. Sandy soils.	Likely based on nearby records and presence of preferred habitat	Unlikely based on habitat preferences
Conostylis misera HAEMODORACEAE	VU	EN	Rhizomatous, tufted perennial, grass-like or herb, 0.05-0.18 m high. Fl. yellow, Oct to Nov. White or grey sand, sandy loam. Winter-wet flats.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Could have been missed among dense vegetation
Corysanthes limpida ORCHIDACEAE	P4	Not listed	Tuberous herb to 0.02 m high. Fl. July to early-Sep. Peaty soils in seasonally damp flats.	Possible based on habitat preferences	Possible based on habitat preferences Could have been missed among dense vegetation
Diuris drummondii ORCHIDACEAE	EN	VU	Tuberous, perennial, herb, 0.5-1.05 m high. Fl. yellow, Nov to Dec or Jan. Low-lying depressions, swamps.	Possible based on habitat preferences	Possible based on habitat preferences Could have been missed among dense vegetation
Drakaea micrantha ORCHIDACEAE	EN	VU	Tuberous, perennial, herb, 0.15-0.3 m high. Fl. red & yellow, Sep to Oct. White-grey sand.	Possible based on habitat preferences	Unlikely based on habitat preferences
Drosera fimbriata DROSERACEAE	P4	Not listed	Erect tuberous, perennial, herb, 0.05-0.15 m high. Fl. white, Sep to Oct. White sand, granite.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Drosera paleacea DROSERACEAE	P1	Not listed	Fibrous-rooted, rosetted perennial, herb, to 0.03 m high, to 0.015 m wide. Fl. white-cream, Sep to Dec or Jan. White sand, sandy clay.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Could have been missed among dense vegetation
Eucalyptus newbeyi MYRTACEAE	P3	Not listed	Tree, 5-8 m high, bark smooth. Fl. yellow-green, Sep to Dec or Jan to Feb. Sandy clay, loam. Steep spongolite valley sides & cliffs forming river banks.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Eucalyptus x missilis MYRTACEAE	P4	Not listed	(Mallee), to 3 m high, bark smooth. Fl. yellow/cream-white, Jan to Apr. Sand over limestone or granite. Coastal sites.	Possible based on habitat preferences	Unlikely based on habitat preferences
Gahnia sclerioides CYPERACEAE	P4	Not listed	Lax, slender rhizomatous, perennial, grass-like or herb (sedge), 0.3-0.9 m high. Loam, sandy soils. Moist shaded situations.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Could have been missed among dense vegetation

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Taxon FAMILY	State	Cth	Description	Likelihood of Occurrence	Reassessment Post-field
Gonocarpus pusillus HALORAGACEAE	P4	Not listed	Prostrate annual, herb, 0.05-1.2 m high. Fl. green/yellow-red, Nov to Dec. Grey sandy clay. Winter-wet swamps.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Smaller plants could have been missed among dense vegetation
Gonocarpus simplex HALORAGACEAE	P4	Not listed	Tufted perennial, herb, 0.2-0.6 m high. Fl. green/red-brown, Nov to Dec. Peaty sand. Swamps, seasonally inundated areas.	Possible based on habitat preferences	Possible based on habitat preferences Could have been missed among dense vegetation
Goodenia sp. South Coast (A.R. Annels ARA 1846) GOODENIACEAE	P3	Not listed	Slender, erect herb, 0.3-0.45 m high. Fl. blue, Nov to Dec. Gravelly loams, sandy clays. Edge granite outcrop, roadside.	Possible based on habitat preferences	Possible based on habitat preferences Could have been missed among dense vegetation
Gyrostemon thesioides GYROSTEMONACEAE	P2	Not listed	Straggling, decumbent shrub, to 0.7 m high. Fl. red-orange-yellow/yellow-green, Nov. Sand over limestone. Consolidated coastal dunes.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Hakea lasiocarpha PROTEACEAE	P3	Not listed	Erect shrub, to 6 m high. Fl. white, May to Jul. Sandy loam soils, organic litter over sand, clay or gravel. Hill tops, valleys.	Possible based on habitat preferences	Unlikely to have been missed by survey due to its size.
Hydrocotyle serendipita ARALIACEAE	P2	Not listed	Annual herb to 0.1 m high and 0.5 m wide. Fl. White to pale pink, Oct to Dec. Fire ephemeral, grey-black or orange-brown sand. Gullies and base of outcropping granite.	Possible based on habitat preferences	Possible based on habitat preferences Could have been missed among dense vegetation
Isopogon buxifolius var. *buxifolius* PROTEACEAE	EN	Not listed	Upright shrub, 0.3-1.7 m high. Fl. pink/blue-purple/cream-white-green, May to Dec. Sandy soils, gravelly loam or clay. Sandplains, wet or swampy areas.	Possible based on habitat preferences	Possible based on habitat preferences Could have been missed among dense vegetation
Isopogon uncinatus PROTEACEAE	CR	EN	Tufted spreading or prostrate, non-lignotuberous shrub, 0.05-0.4 m high. Fl. yellow/cream, Oct to Nov. Loam or sand on granite, peaty sand. Swampy depressions, hillslopes.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Could have been missed among dense vegetation
Juncus meianthus JUNCACEAE	P3	Not listed	Tufted perennial, herb, 0.05-0.2 m high, to 0.4 m wide. Fl. brown, Nov to Dec or Jan. Black sand, sandy clay. Creeks, seepage areas.	Possible based on habitat preferences	Possible based on habitat preferences

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Taxon FAMILY	State	Cth	Description	Likelihood of Occurrence	Reassessment Post-field
					Could have been missed among dense vegetation
Kennedia glabrata FABACEAE	VU	VU	Prostrate shrub, 0.05-0.5 m high, to 5 m wide. Fl. red, Aug to Nov. Soil pockets, sandy soils. Granite outcrops.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Kunzea pauciflora MYRTACEAE	P4	Not listed	Erect, compact shrub, (0.35-)0.5-1.2(-1.5) m high. Fl. pink, Aug to Nov. Gravelly sandy or loamy soils over limestone, sandstone or spongolite. Hillsides, coastal slopes.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Lachnagrostis billardierei subsp. *billardierei* POACEAE	P3	Not listed	Annual, herb. Fl. purple/green, Dec. Sand over granite. Hilltops.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Lasiopetalum sp. Denmark (B.G. Hammersley 2012) MALVACEAE	P3	Not listed	No description available	Possible based on regional distribution	Possible based on regional distribution Could have been missed among dense vegetation
Lepidium pseudotasmanicum BRASSICACEAE	P4	Not listed	Erect annual or biennial, herb, 0.2-0.4(-1) m high. Fl. white-green, Feb or Dec. Loam, sand.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Could have been missed among dense vegetation
Leucopogon alternifolius ERICACEAE	P3	Not listed	Erect or semi-erect, scrambling shrub, 0.1-1(-2) m high. Fl. white/white-pink, Aug to Dec. Grey/white sand. Swampy areas, seasonally wet areas.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Smaller plants could have been missed among dense vegetation
Leucopogon altissimus ERICACEAE	P3	Not listed	Erect shrub to 1.5 m high. Fl. Cream, Aug to Oct. Sand, loam, seasonally wet areas, outcropping granite.	Possible based on habitat preferences	Possible based on habitat preferences Smaller plants could have been missed among dense vegetation
Leucopogon bracteolaris ERICACEAE	P2	Not listed	Shrub, 0.25-1 m high. Fl. white, Feb or May or Jul or Oct. Stony sand, gravelly loam.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Smaller plants could have been missed among dense vegetation

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Taxon FAMILY	State	Cth	Description	Likelihood of Occurrence	Reassessment Post-field
Lysinema lasianthum ERICACEAE	P4	Not listed	Spindly shrub, 0.25-0.7 m high. Fl. white-cream, Jul to Nov. Swamps, seasonally wet areas.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Could have been missed among dense vegetation
Microtis globula ORCHIDACEAE	EN	VU	Tuberous, perennial, herb, 0.18-0.35 m high. Fl. yellow-green, Dec or Jan. Peaty soils. Winter-wet swamps.	Possible based on habitat preferences	Possible based on habitat preferences Could have been missed among dense vegetation
Microtis pulchella ORCHIDACEAE	P4	Not listed	Tuberous, perennial, herb, 0.12-0.25 m high. Fl. white, Nov to Dec or Jan. Peaty sand. Winter-wet swamps.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Could have been missed among dense vegetation
Microtis quadrata ORCHIDACEAE	P4	Not listed	Tuberous perennial herb to 0.8 m high. Fl. Dec-Jan. Clayey soils. Swamps.	Likely based on nearby records	Possible based on habitat preferences Could have been missed among dense vegetation
Poa billardierei POACEAE	P3	Not listed	Tussock grass to 1.3 m high. Fl. Sep to Nov. White sands. Coastal Dunes.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Prasophyllum paulinae ORCHIDACEAE	P1	Not listed	Tuberous herb to 0.25 m high. Fl. Yellowish-green and purple, Sep to Nov. Seasonally wet flats.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Could have been missed among dense vegetation
Pterostylis heberlei ORCHIDACEAE	P2	Not listed	Tuberous herb to 0.4 m high. Fl. Brown, green and white, Aug to early-Oct. Sandy soils.	Possible based on habitat preferences	Unlikely based on habitat preferences
Schoenus sp. Grassy (E. Gude & J. Harvey 250) CYPERACEAE	P2	Not listed	Rhizomatous, perennial, grass-like or herb (sedge), to 0.7 m high. Fl. yellow. Black silt. Swamps.	Possible based on habitat preferences	Possible based on habitat preferences Could have been missed among dense vegetation
Schoenus sp. Grey Rhizome (K.L. Wilson 2922) CYPERACEAE	P1	Not listed	Grass-like or herb (sedge), 0.06-0.08 m high. Sandy clay, sand.	Possible based on habitat preferences	Unlikely based on habitat preferences
Sphenotoma drummondii ERICACEAE	EN	EN	Tufted shrub, 0.15-0.5 m high. Fl. white, Sep to Dec. Stony or shallow soils over granite or quartzite. Steep rocky slopes, crevices of rocks.	Unlikely based on habitat preferences	Unlikely based on habitat preferences

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Taxon FAMILY	State	Cth	Description	Likelihood of Occurrence	Reassessment Post-field
Spyridium spadiceum RHAMNACEAE	P4	Not listed	Erect slender or weak semi-prostrate shrub, 0.15-3 m high. Fl. white, Aug to Dec or Jan to Feb or Apr. Sand or gravelly loam. Granitic hills.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Stenanthemum sublineare RHAMNACEAE	P2	Not listed	Erect shrub, to 0.1 m high. Fl. green, Oct to Dec. Littered white sand. Coastal plain.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Stylidium articulatum STYLIDIACEAE	P2	Not listed	Rosetted perennial, herb, 0.15-0.25 m high. Fl. pink, Nov to Dec. Sandy loam, granite. Hills, coastal heath.	Likely based on nearby records and presence of preferred habitat	Unlikely based on habitat preferences
Stylidium falcatum STYLIDIACEAE	P2	Not listed	Perennial, herb, 0.15-0.35(-0.6) m high. Fl. white, Oct to Nov. Sand, gravelly clay loam. Plains, lateritic ridges.	Likely based on nearby records and presence of preferred habitat	Unlikely based on habitat preferences
Styphelia cymbiformis ERICACEAE	P2	Not listed	Sprawling perennial shrub to 0.7 m high. Fl. white to pink, Nov to Dec. Varied habitats.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Smaller plants could have been missed among dense vegetation
Synaphea incurva PROTEACEAE	P3	Not listed	Clumped, spreading shrub. Fl. yellow, Sep to Nov. Gravelly loam, sandy soils. Slopes.	Possible based on habitat preferences	Unlikely based on habitat preferences
Synaphea preissii PROTEACEAE	P3	Not listed	Erect, low shrub, 0.15-0.4 m high. Fl. yellow, Jul to Nov. Sand, gravelly loam.	Likely based on nearby records and presence of preferred habitat	Unlikely based on habitat preferences
Thelymitra porphyrosticta ORCHIDACEAE	P2	Not listed	Tuberous herb to 0.35 m high. Fl. Purple, mauve, orange and yellow, Aug-Sep. Sandy soils.	Likely based on nearby records and presence of preferred habitat	Unlikely based on habitat preferences
Thomasia multiflora MALVACEAE	P1	Not listed	Spreading shrub, 0.3-1 m high, to 2 m wide. Fl. pink-purple, Sep to Oct. Black sand. Seasonally wet areas, granite outcrops.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Smaller plants could have been missed among dense vegetation
Thomasia purpurea x solanacea MALVACEAE	P1	Not listed	Shrub, 0.5-0.8 m high. Fl. pink-purple, Nov to Dec or Jan. Grey sand over limestone. Creek sides.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Thomasia quercifolia	P4	Not listed	Shrub, ca 1 m high.	Possible based on regional distribution	Possible based on regional distribution

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Taxon FAMILY	State	Cth	Description	Likelihood of Occurrence	Reassessment Post-field
MALVACEAE					Smaller plants could have been missed among dense vegetation
Thomasia solanacea MALVACEAE	P4	Not listed	Erect shrub, 0.5-3 m high. Fl. blue-purple-pink, Sep to Dec. Alluvium, sand over limestone, rocky loam. Coastal areas.	Likely based on nearby records and presence of preferred habitat	Possible based on habitat preferences Smaller plants could have been missed among dense vegetation
Thysanotus gageoides ASPARAGACEAE	P3	Not listed	Perennial, herb (with tuberous roots), to 0.2 m high. Fl. purple, Oct to Nov. Sand, clay, granite, sandstone, laterite.	Possible based on habitat preferences	Unlikely based on habitat preferences
Thysanotus isantherus ASPARAGACEAE	P4	Not listed	Caespitose perennial, herb (with tuberous roots), to 0.15 m high. Fl. purple, Nov to Dec. Granite.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Verticordia endlicheriana var. *angustifolia* MYRTACEAE	P3	Not listed	Erect shrub, 0.3-0.5 m high. Fl. yellow, Oct to Nov. Sandy clay. Granite outcrops.	Unlikely based on habitat preferences	Unlikely based on habitat preferences
Verticordia fimbrilepis subsp. *australis* MYRTACEAE	EN	VU	Slender shrub, 0.2-0.4 m high. Fl. pink, Oct to Dec. Shallow sand, clay loam. Granite outcrops.	Unlikely based on habitat preferences	Unlikely based on habitat preferences

Table B.2 Conservation significant fauna identified by database searches and their likelihood of presence in the Survey Area

Taxon Common Name COM_NAME	State	Cth	Habitat	Likelihood of Occurrence
BIRDS				
Actitis hypoleucos Common Sandpiper	MI	MI	Occurs in a wide variety of habitats on the shores of waterbodies (Pizzey & Knight, 1997). Shallow, pebbly, muddy or sandy edges of rivers and streams, coastal to far inland; dams, lakes, sewage ponds, margins of tidal rivers, waterways in mangroves or saltmarsh; mudflats; rocky or sandy beaches, causeways, riverside lawns, drains, street gutters.	Regular migrant or visitor; recorded on the rocks fringing the Survey Area
Aphelocephala leucopsis Southern Whiteface	Not listed	VU	Occurs across most of mainland Australia south of the tropics, in a wide range of open woodlands and shrublands where there is an understory of grasses, shrubs	Absent - out of range

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Taxon Common Name COM_NAME	State	Cth	Habitat	Likelihood of Occurrence
			or both. Habitats are usually dominated by Acacias or eucalypts on ranges, foothills, lowlands and plains. They nest in hollows and crevices of trees (TSSC, 2023).	
Apus pacificus Fork-tailed Swift, Pacific Swift	MI	MI	Airborne over a variety of habitats from rainforest to arid areas (Pizzey & Knight, 1997). Aerial: open country, from semi-deserts to coasts, islands; sometimes over forests, cities (Pizzey & Knight 2012).	Vagrant
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater	VU	MI	Temperate to tropical waters, breeding on islands off southern WA, also SA and Lord Howe. Often attracted to fishing vessals. Trans-equatorial migrant in Pacific and Indian oceans, largely absent May-Sep.	Vagrant
Ardenna grisea Sooty shearwater	MI	MI	Warm-temperate to cold subantarctic oceans. In Australia, breeds on offshore islands off NSW and Tasmania.	Vagrant
Ardenna tenuirostris Short-tailed shearwater	MI	MI	Inshore and offshore waters (Menkhorst, et al., 2019)	Vagrant
Arenaria interpres Ruddy turnstone	MI	MI	Occurs in a wide variety of habitats on the shores of waterbodies, commercial saltfields, open or ploughed ground (Pizzey & Knight, 1997). Coastal/marine (Pizzey & Knight 2012).	Regular migrant or visitor
Atrichornis clamosus noisy scrub-bird, tjimiluk	EN	EN	Dense, unburnt understorey vegetation of low forest, scrub thicket and occasionally heath that occur in gullies, drainage lines and lowland areas.	Locally extinct
Botaurus poiciloptilus Australasian bittern	EN	EN	Occurs in or over water in tall reedbeds, sedges, rushes or Typha; drains in tussocky paddocks, occasionally saltmarsh or brackish wetlands (Pizzey & Knight, 2012).	Locally extinct
Calidris acuminata Sharp-tailed sandpiper	MI	MI	Tidal mudflats, saltmarshes, mangroves; shallow fresh, brackish or saline inland wetlands; floodwaters, irrigated pastures and crops; sewage ponds, saltfields (Pizzey & Knight, 2012).	Regular migrant or visitor
Calidris alba Sanderling	MI	MI	Broad ocean beaches of firm sand 'where waves ebb and flow', depositing strands and heaps of seaweed; often near river mouths; also inlets, tidal mudflats, coastal lagoons (Pizzey & Knight, 2012).	Regular migrant or visitor

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Taxon Common Name COM_NAME	State	Cth	Habitat	Likelihood of Occurrence
Calidris canutus Red knot	EN	EN	Tidal mudflats, sandflats, beaches, saltmarshes, flooded pastures and ploughed lands (Pizzey & Knight, 1997).	Regular migrant or visitor
Calidris ferruginea curlew sandpiper	CR	MI	Tidal mudflats, saltmarsh, saltfields; fresh, brackish or saline wetlands and sewage ponds (Pizzey & Knight, 1997).	Regular migrant or visitor
Calidris ruficollis red-necked stint	MI	MI	Tidal mudflats, saltmarshes; sandy or shelly beaches; saline and freshwater wetlands, coastal and inland; saltfields, sewage ponds (Pizzey & Knight, 2012).	Regular migrant or visitor; recorded on adjacent mud flats
Calidris subminuta Long-toed Stint	MI	MI	Tussocky, weedy margins of shallow wetlands, both coastal and inland, sewage ponds, weed on tidelines, tidal mudflats (Pizzey & Knight, 2012).	Regular migrant or visitor
Calidris tenuirostris Great knot	CR	MI	Tidal mudflats, sandy ocean and bay shores, estuaries, shallow saline and freshwater wetlands (Pizzey & Knight, 1997).	Regular migrant or visitor
Calyptorhynchus banksii naso forest red-tailed black cockatoo	VU	VU	Marri, jarrah, wandoo, tuart and karri woodlands and forests, where they feed primarily on marri and jarrah (Johnstone & Kirkby, 2011).	Regular migrant or visitor; recorded adjacent
Cereopsis novaehollandiae grisea Cape Barren Goose, Recherche Cape Barren goose	VU	VU	Offshore islands, grassy patches among low scrub and rocks, beaches and headlands, pasture, shallow wetlands, irrigated crops (Menkhorst et al. 2019).	Absent - out of range
Charadrius leschenaultii Greater sand plover, large sand plover	VU	MI	Wide, sandy or shelly beaches; sandspits, tidal mudflats, reefs, sand cays, mangroves, saltmarsh, dunes, bare paddocks; seldom far inland (Pizzey & Knight, 2012).	Regular migrant or visitor
Charadrius mongolus Lesser Sand Plover	EN	MI	Tidal mudflats and sandflats; gently sloping sandy or shelly beaches, saltmarsh, estuaries, atolls, reefs, mangroves and airfields (Pizzey & Knight, 2012). . Occasionally found inland on freshwater lakes, swamps, bore drains etc.	Regular migrant or visitor
Dasyornis longirostris western bristlebird	EN	EN	Very restricted distribution, mostly between Two Peoples Bay and Wychinicup Inlet in dense, low, coastal heath.	Locally extinct
Diomedea antipodensis Antipodean Albatross	MI/EN	VU/MI	A sea bird, spending most of its time at sea. Does not breed in Australia (Menkorst et al. 2019).	Vagrant

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Taxon Common Name COM_NAME	State	Cth	Habitat	Likelihood of Occurrence
Diomedea dabbenena Tristan Albatross	CR	EN/MI	A seabird with a poorly understood distribution. Breeds on islands of the Tristan da Cunha archipelago (Pizzey & Knight, 2012).	Vagrant
Diomedea epomophora Southern Royal Albatross	VU	VU/MI	A seabird found in offshore waters. Does not breed in Western Australia (Pizzey & Knight, 2012).	Vagrant
Diomedea exulans Wandering Albatross	MI	VU	A seabird found in offshore waters south of Fremantle. Breeds at high latitudes in the S. Indian and S. Atlantic oceans (Pizzey & Knight, 2012).	Vagrant
Diomedea sanfordi Northern Royal Albatross	EN	EN/MI	A seabird which does not breed in Western Australia. Rarely seen from land (Menkhorst, et al., 2019).	Vagrant
Falco hypoleucos Grey Falcon	VU	VU	Inhabits open plains with treed watercourses in the arid inland (Menkhorst et al. 2019).	Vagrant
Falco peregrinus Peregrine falcon	OS	Not listed	Diverse habitats ranging from rainforest to the coast, alpine areas and arid shrublands (Pizzey & Knight, 1997). Cliffs, gorges, timbered watercourses, environs of rivers, wetlands, plains, open woodlands pylons, spires, buildings (Pizzey & Knight, 2012).	Regular migrant or visitor
Halobaena caerulea Blue Petrel	Not listed	VU	A seabird occurring offshore south of Fremantle. Breeds on sub-Antarctic islands (Pizzey & Knight, 2012).	Vagrant
Hydroprogne caspia Caspian Tern	MI	MI	Sheltered coastal bays with sandy or muddy margins, and near coastal or inland saline or brackish waterbodies (DCCEEW, 2023).	Irregular visitor; recorded on adjacent mudflats
Leipoa ocellata malleefowl	VU	VU	Mallee, Acacia, paperbark, sheoak and other scrubs, eucalypt woodland and coastal heaths, mainly on sandy or gravel soils (Pizzey & Knight, 2012).	Absent - out of range
Limosa lapponica Bar-tailed Godwit	MI	MI	Tidal mudflats, estuaries, sewage ponds, shallow river margins, brackish or saline inland lakes, flooded pastures and airfields (Pizzey & Knight, 1997).	Regular migrant or visitor
Limosa limosa Black-tailed Godwit	MI	MI	Shallow inland wetlands and on coast. Prefers sites with muddy substrates where it feeds by wading. Does not breed in Australia (Menkhorst et al. 2019).	Regular migrant or visitor
Macronectes giganteus Southern Giant Petrel	MI	EN	A seabird, breeding on Antarctic and sub-Antarctic islands (Pizzey & Knight, 1997)	Vagrant

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Taxon Common Name COM_NAME	State	Cth	Habitat	Likelihood of Occurrence
Macronectes halli Northern Giant Petrel	No listed	VU/MI	A seabird, breeding on sub-Antarctic islands. Common on inland and offshore waters from approximately south of Fremantle (Pizzey & Knight, 1997).	Vagrant
Numenius madagascariensis Eastern Curlew	CR	CR	Estuaries, tidal mudflats, sandspits, saltmarshes, mangroves, fresh or brackish lakes, grasslands near water (Pizzey & Knight, 1997).	Vagrant
Numenius phaeopus Whimbrel	MI	MI	Estuaries, mangroves, tidal flats, coral cays, exposed reefs, flooded paddocks, sewage ponds, bare grasslands, sportsgrounds, lawns (Pizzey & Knight, 2012).	Regular migrant or visitor
Oceanites oceanicus Wilson's Storm-petrel	MI	MI	Wilson's Storm-Petrel spends much of its life at sea (Marchant & Higgins 1990).	Vagrant
Oxyura australis Blue-billed Duck	P4	Not listed	Well vegetated freshwater swamps, large dams, lakes (Pizzey & Knight, 2012).	Regular migrant or visitor
Pachyptila turtur subantarctica Fairy Prion (southern)	Not listed	VU	A seabird found in offshore waters. Breeds on sub-Antarctic islands (Menkhorst, et al., 2019).	Vagrant
Pandion cristatus Osprey, Eastern Osprey	MI	MI	Coasts, inshore waters, tidal reaches of large streams (Menkhorst, et al., 2019).	Regular migrant or visitor; recorded on adjacent mudflats
Pezoporus flaviventris Western Ground Parrot	CR	CR	Dense heathland in Cape Arid National Park and southwest Western Australia.	Locally extinct
Phaethon rubricauda Red-Tailed Tropicbird	P4	EN/MI	Tropical pelagic waters, rarely near land unless breeding (Menkhorst et al. 2019).	Vagrant
Philomachus pugnax Ruff (Reeve)	MI	MI	Nests in marshes of the low Arctic. Occupies a variety of open, moist habitats. Grasslands, agricultural lands, freshwater wetlands (Menkhorst et al., 2019).	Vagrant
Phoebetria fusca Sooty Albatross	MI	MI	A seabird found in offshore waters. Breeds on sub-Antarctic islands (Pizzey & Knight, 2012).	Vagrant
Plegadis falcinellus Glossy Ibis	MI	MI	Well vegetated wetlands, wet pastures, ricefields, floodwaters, floodplains, brackish or saline wetlands, mangroves, mudflats and occasionally dry-grasslands (Pizzey & Knight, 2012).	Regular migrant or visitor

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Taxon Common Name COM_NAME	State	Cth	Habitat	Likelihood of Occurrence
Pluvialis fulva Pacific Golden Plover	MI	MI	Estuaries, mudflats, saltmarshes, mangroves, rocky reefs and stranded seaweed on ocean shores; margins of shallow open inland swamps; sewage ponds, short-grass paddocks, sportsgrounds, airfields, ploughed land (Pizzey & Knight, 2012).	Regular migrant or visitor
Pluvialis squatarola Grey Plover	MI	MI	Occurring almost entirely in coastal areas, inhabits sheltered bays, estuaries and lagoons with mudflats and sandflats, and occasionally on rocky coasts. They also occur around terrestrial wetlands such as near-coastal lakes and swamps, or salt-lakes (DCCEEW, 2023). Mudflats, saltmarsh; tidal reefs and estuaries; rarely inland (Pizzey & Knight, 2012).	Regular migrant or visitor; recorded on adjacent mudflats
Psophodes nigrogularis Western Whipbird	EN or P4	Not listed	Dense, low scrub, heath and mallee thickets 1-2 m tall with open space at ground level (Menkhorst et al., 2019).	Locally extinct
Psophodes nigrogularis nigrogularis Western Whipbird (Western Heath)	EN	EN	Dense, low scrub, heath and mallee thickets 1-2 m tall with open space at ground level (Menkhorst et al., 2019).	Locally extinct
Pterodroma mollis Soft-plumaged Petrel	Not listed	VU	A seabird found in offshore waters. Breeds on sub-Antarctic islands (Pizzey & Knight, 2012).	Vagrant
Puffinus huttoni Hutton's shearwater	EN	Not listed	Tropical inshore waters and offshore. Breeds in New Zealand mountains.	Vagrant
Stercorarius antarcticus lonnbergi Brown Skua, Subantarctic Skua	P4	Not listed	Strictly marine birds in the Australian region. Apr-Sep off the south of Western Australia, can be seen in larger aggregations near to dead seals, Gannet populations etc. Rarely seen ashore.	Vagrant
Stercorarius maccormicki South polar Skua	MI	MI	Circumpolar seabird nesting on Antarctic shorelines (Menkhorst et al., 2019).	Vagrant
Stercorarius parasiticus Arctic Jaeger, Arctic Skua	MI	MI	Trans-equatorial migrant, prefers inshore waters, enters bays. Less common in offshore waters.	Vagrant
Sternula nereis nereis Australian Fairy Tern	Not listed	VU	Coastal waters, bays, inlets, saline or brackish lakes, saltfields, sewage ponds near coast (Pizzey & Knight, 2012).	Regular migrant or visitor; recorded on adjacent mudflats

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Taxon Common Name COM_NAME	State	Cth	Habitat	Likelihood of Occurrence
Thalassarche carteri Indian Yellow-nosed Albatross	EN	VU	A seabird found in offshore waters. Breeds on sub-Antarctic islands (Pizzey & Knight, 2012).	Vagrant
Thalassarche cauta cauta Shy Albatross	VU	EN/MI	A seabird found in offshore waters. Breeds on Albatross Is. Bass Strait (Pizzey & Knight, 2012).	Vagrant
Thalassarche chlororhynchos Atlantic Yellow-nosed Albatross	MI	MI	A seabird with a poorly understood distribution. Breeds on Gough Is. and islands of the Tristan da Cunha archipelago (Pizzey & Knight, 2012).	Vagrant
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross	Not listed	VU/MI	A seabird found in offshore waters. Breeds on Campbell Is. (New Zealand region) (Pizzey & Knight, 2012).	Vagrant
Thalassarche melanophris Black-Browed Albatross	MI	MI	A seabird found in offshore waters. Breeds on sub-Antarctic islands (Menkhorst, et al., 2019).	Vagrant
Thalassarche steadi White-capped Albatross	Not listed	VU/MI	A seabird found in offshore waters. Breeds on Auckland Is. Group and Antipodes Is. (New Zealand region) (Pizzey & Knight, 2012).	Vagrant
Thalasseus bergii Crested Tern	MI	MI	Coastal, offshore waters; beaches, bays, inlets, tidal rivers, salt swamps, lakes and larger rivers (Pizzey & Knight, 2012).	Regular migrant or visitor; recorded on adjacent mudflats
Thinornis rubricollis Hooded Plover, Hooded Dotterel	P4	Not listed	Broad sandy ocean beaches with plentiful seaweed, and adjacent dunes; weedy rock shelves and reefs, occasionally tidal flats; coastal and inland salt lakes (Pizzey & Knight, 2012).	Regular migrant or visitor
Tringa brevipes Grey-tailed Tattler	P4	MI	The Grey-tailed Tattler is often found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. It can also be found at intertidal rocky, coral or stony reefs as well as platforms and islets that are exposed at low tide. It has been found around shores of rock, shingle, gravel or shells and also on intertidal mudflats in embayments, estuaries and coastal lagoons, especially fringed with mangroves. In Moreton Bay, Queensland, it is most abundant in areas with dense beds of seagrass. In Tasmania it is also abundant in areas with seagrass beds. It is less often on open flat sandy beaches or sandbanks, especially around accumulated seaweed or isolated clumps of dead coral. It is occasionally found around near-coastal wetlands, such as lagoons and lakes and	Regular migrant or visitor

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Taxon Common Name COM_NAME	State	Cth	Habitat	Likelihood of Occurrence
			ponds in sewage farms and saltworks. Inland records for the species are rare with sightings on river banks and the edges of rock pools (Higgins & Davies 1996).	
Tringa glareola Wood Sandpiper	MI	MI	Muddy wetland margins, tidal mangroves, margins of tidal mudflats, saltmarshes and sewage ponds (Pizzey & Knight, 2012).	Regular migrant or visitor
Tringa nebularia Common Greenshank, Greenshank	MI	MI	Mudflats, estuaries, saltmarshes, margins of lakes; wetlands, fresh and saline claypans, saltfields and sewage ponds (Pizzey & Knight, 2012).	Regular migrant or visitor
Tringa stagnatilis Marsh Sandpiper, Little Greenshank	MI	MI	Wetlands (freshwater, salt or brackish), sewage ponds, saltfields, bore drains, mangroves, tidal mudflats, estuaries (Pizzey & Knight, 2012).	Regular migrant or visitor
Tyto novaehollandiae novaehollandiae Masked Owl (southwest)	P3	Not listed	Inhabits a variety of forests and woodlands, roosting in tree hollows, dense foliage or caves.	Irregular visitor
Xenus cinereus Terek Sandpiper	MI	MI	Tidal mudflats, estuaries; shores and reefs of islands; coastal swamps, commercial saltfields.	Regular migrant or visitor
Zanda baudinii Baudin's Cockatoo	EN	EN	Eucalypt forests, especially marri-jarrah and karri forests, less commonly in woodlands of wandoo, blackbutt, flooded gum, yate, and cleared areas (Johnstone & Kirkby, 2011).	Regular migrant or visitor
Zanda latirostris Carnaby's Cockatoo	EN	EN	Forests, woodlands and shrublands of Eucalyptus and Proteaceae species, where they feed primarily on Banksia, Hakea and marri, pine plantations and urban areas (Johnstone, et al., 2011; Pizzey & Knight, 1997).	Regular migrant or visitor
FISH				
Galaxias truttaceus (Western Australian population) Western Trout Minnow, Western Spotted Galaxias	EN	EN	On the south coast in near-coastal freshwater rivers and their tributaries and associated downstream lakes. The species is tolerant of tannin-stained acidic waters.	Potentially resident

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Taxon Common Name COM_NAME	State	Cth	Habitat	Likelihood of Occurrence
Galaxiella munda Mud Minnow, Western Dwarf Galaxias	VU	Not listed	Swift flowing streams within karri forests and is typically found near submerged vegetation, occasionally in the still water of ponds, swamps and roadside drains, and often inhabiting darkly tannin-stained and acidic water.	Potentially resident
Galaxiella nigrostriata Black-Stripe Minnow, Black-Striped Dwarf Galaxias	EN	EN	Acidic ephemeral wetlands of the south-west of Western Australia. Generally prefer sandy soils (has been shown to be more suited for burrowing). Has been documented to survive in both natural wetlands, as well as excavated roadside pools.	Potentially resident
Geotria australis Pouched Lamprey	P3	Not listed	South-west coast, spawning in rivers.	Absent - no habitat
Lepidogalaxias salamandroides Salamanderfish	EN	Not listed	Pools in sandy peat flat areas. These waters are usually darkly tannin stained and often very acidic (pH 3.0-6.5).	Potentially resident
Nannatherina balstoni Balston's Pygmy Perch	VU	VU	Inundated riparian vegetation, in pools that often dry up in coastal flats of the South-west. Has also been found in the Collie River.	Potentially resident
INVERTEBRATES				
Cynotelopus notabilis Western Australian Pill Millipede	EN	Not listed	A short range endemic inhabiting deep litter, esp. karri bark, and under logs or rocks associated with granite tors (Main et al., 2002).	Unlikely - habitat dubious
Helicarion castanea a Helicarionid land snail	EX	Not listed	No information available. Last collected in 1925 near the Preston River.	Locally extinct
Hylaeus globuliferus Woolybush Bee	P3	Not listed	This native bee is distributed across the south-west of western Australia, with 223 records in the Atlas of Living Australia (ALA 2023). *Hylaeus globuliferus* is known to be associated with *Adenanthos cygnorum* and *Banksia attenuata* amongst other native plants (Houston 2018)	Absent - no habitat
Trioza barrettae Banksia brownii Plant-louse	EN	EN	Associated with its host plant *Banksia brownii*, which is associated with a range of habitats including thickets and mallee-heath and mallee heath shrublands and woodlands that are rich in proteaceous and myrtaceous species.	Absent - no habitat

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Taxon Common Name COM_NAME	State	Cth	Habitat	Likelihood of Occurrence
Westralunio carteri Carter's Freshwater Mussel	VU	VU	Perennial streams, rivers, lakes and reservoirs, occasionally swamps with a salinity of <1.6 g/L and sediments composed of sand/mud/clay which are soft enough for burrowing, but stable enough for support.	Absent - no habitat
Zephyrarchaea mainae Main's Assassin Spider	VU	Not listed	Known from Walpole-Nornalup National Park (near Walpole) east to Bremer Bay and north to the Porongurup National Park, with a range centred on the Torndirrup Peninsula south of Albany. Specimens have been collected by beating and sifting sedges *(Lepidosperma* sp.), curly grass (*Empodisma gracillimum*) and low shrubs in dense coastal or near-coastal groves of Peppermint, with several outlying populations also known from wet Karri forest (Rix and Harvey, 2012).	Potentially resident
MAMMALS				
Arctocephalus forsteri New Zealand Fur-seal, Long-Nosed Fur-seal	OS	Not listed	Oceanic waters and rocky islands off the coast.	Unlikely visitor
Arctocephalus tropicalis Subantarctic Fur-seal	VU	Not listed	Oceanic waters and rocky islands off the coast.	Unlikely visitor
Bettongia penicillata ogilbyi Woylie, Brush-Tailed Bettong	CR	EN	Open, sclerophyllous forests and woodlands with a dense understorey/ground cover of tussock grasses or woody scrub (DBCA, 2017).	Potentially resident, but low likelihood
Dasyurus geoffroii Chuditch, Western Quoll	VU	VU	Forests, mallee shrublands, heathlands and woodlands (DBCA, 2017), with a preference for riparian locations in the jarrah forest (DEC, 2012).	Irregular visitor
Falsistrellus mackenziei Western False Pipistrelle, Western Falsistrelle	P4	Not listed	Mostly Karri wet sclerophyll forest or high-rainfall zones of Jarrah forest; also Tuart forest and adjacent woodlands. Roosts in tree hollows (van Dyke et al., 2013).	Irregular visitor
Hydromys chrysogaster Water-rat, Rakali	P4	Not listed	Occurs in a variety of aquatic environments (Menkhorst & Knight, 2011).	Irregular visitor
Isoodon fusciventer Quenda, Southwestern Brown Bandicoot	P4	Not listed	Dense, scrubby, often swampy vegetation (DEC, 2012). Forest, woodland, shrub and heath communities, ideally with sandy soils and dense health vegetation in the lower stratum	Resident

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Taxon Common Name COM_NAME	State	Cth	Habitat	Likelihood of Occurrence
Limosa lapponica menzbieri Dibbler	CR	EN/MI	A wader occurring on tidal flats throughout Western Australia's coast. Does not breed in Western Australia (Menkhorst, et al., 2019).	Locally extinct
Macrotis lagotis Bilby, Dalgyte, Ninu	VU	VU	Mitchell grass and stony downs country of cracking clays. Also desert sandplains and dune fields, sometimes with spinifex hummock grasslands and Acacia shrubland.	Locally extinct
Neophoca cinerea Australian Sea-lion	VU	EN	Colonies found on near-shore islands. Females pup on rocky platforms, dunes and limestone crevices. Forages on continental shelf or shelf break.	Irregular visitor
Notamacropus eugenii derbianus Tammar Wallaby	P4	Not listed	Coastal scrub, heath, dry sclerophyll forest and thickets in mallee and woodland. Requires dense, low vegetation for daytime shelter and open, grassy areas for feeding.	Locally extinct
Notamacropus irma Western Brush Wallaby	P4	Not listed	Open forest or woodland with a preference for seasonally inundated flats with low grasses and open, scrubby thickets (van Dyck, et al., 2013).	Locally extinct
Parantechinus apicalis Dibbler	EN	EN	Mature mallee-heath on mainland; low heath scrubland on islands	Locally extinct
Phascogale tapoatafa wambenger South-western Brush-tailed Phascogale, Wambenger	CD	Not listed	Dry, sclerophyllous forests and open woodlands that contain hollow-bearing trees, with sparse ground cover (Anon., 2012).	Irregular visitor
Potorous gilbertii Gilbert's Potoroo	CR	CR	On Mt Gardner in *Melaleuca striata* heath with dense sedge understory on slopes; on Bald Island in Taxandria scrub near Eucalyptus stands (van Dyke et al., 2013).	Locally extinct
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir	CR	CR	Coastal and near coastal peppermint -tuart, jarrah-marri, sheoak and eucalypt woodland and mallee woodland (preferably closed-canopy) (DPaW, 2017).	Resident
Setonix brachyurus Quokka	VU	VU	Mainland: tea-tree bordering swamps/watercourses in the Jarrah forest and Karri forests. Rottnest Island: thickets of Acacia, Melaleuca and sedges as well as modified habitats (van Dyck et al. 2013).	Locally extinct

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Taxon Common Name COM_NAME	State	Cth	Habitat	Likelihood of Occurrence
REPTILES				
Elapognathus minor Short-nosed Snake	P2	Not listed	Heaths edging swamps. Shelters in low, dense vegetation such as tussocks and sedges (Wilson and Swan, 2023).	Potentially resident

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Appendix C Species List

Family	Taxon	Status	Notes
Apiaceae	*Centella asiatica*	Weed	
Araceae	*Lemna minor*	Weed	
Araceae	*Zantedeschia aethiopica*	Declared Pest - s22(2)	
Asparagaceae	*Asparagus asparagoides*	Weed	
Asparagaceae	*Yucca aloifolia*	Weed	
Asteraceae	*Cirsium vulgare*	Weed	
Asteraceae	*Cotula coronopifolia*	Weed	
Asteraceae	*Erigeron bonariensis*	Weed	
Asteraceae	*Hypochaeris glabra*	Weed	
Asteraceae	*Sonchus asper*	Weed	
Campanulaceae	*Lobelia anceps*		
Chenopodiaceae	Chenopodiaceae sp.		Sterile
Chenopodiaceae	*Rhagodia baccata* subsp. *baccata*		
Chenopodiaceae	*Tecticornia ?indica* subsp. *bidens*		
Chenopodiaceae	*Threlkeldia diffusa*		
Crassulaceae	*Crassula glomerata*	Weed	
Cupressaceae	Cupressaceae sp.	Weed	Fruit out of reach
Cyperaceae	*Ficinia nodosa*		
Cyperaceae	*Isolepis cernua* var. *setiformis*		
Cyperaceae	*Isolepis prolifera*		
Cyperaceae	*Lepidosperma gladiatum*		
Cyperaceae	*Machaerina articulata*		
Cyperaceae	*Machaerina juncea*		
Dennstaedtiaceae	*Pteridium esculentum*		
Dilleniaceae	*Hibbertia cuneiformis*		
Euphorbiaceae	*Euphorbia paralias*	Weed	
Fabaceae	*Acacia littorea*		
Fabaceae	*Acacia longifolia* subsp. *longifolia*	Weed	
Fabaceae	*Dipogon lignosus*	Weed	
Fabaceae	*Lotus subbiflorus*	Weed	
Fabaceae	*Psoralea pinnata*	Weed	
Geraniaceae	*Geranium molle*	Weed	
Geraniaceae	*Pelargonium capitatum*	Weed	
Iridaceae	*Watsonia meriana*	Weed	
Juncaceae	*Juncus ?kraussii* subsp. *australiensis*		
Juncaceae	*Juncus oxycarpus*	Weed	
Juncaceae	*Juncus pallidus*		

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Family	Taxon	Status	Notes
Lamiaceae	*Stachys arvensis*	Weed	
Malvaceae	*Lagunaria patersonia*	Weed	
Myrtaceae	*Agonis flexuosa*		
Myrtaceae	*Callistemon* sp.	Weed	Sterile, appears planted
Myrtaceae	*Eucalyptus ?conferruminata*		
Myrtaceae	*Eucalyptus cornuta*		
Myrtaceae	*Eucalyptus globulus*	Weed	
Myrtaceae	*Eucalyptus gomphocephala* var. *gomphocephala*		
Myrtaceae	*Eucalyptus petiolaris*	Weed	
Myrtaceae	*Gaudium laevigatum*	Weed	
Myrtaceae	*Lophostemon confertus*	Weed	
Myrtaceae	*Melaleuca rhaphiophylla*		
Myrtaceae	*Metrosideros* sp.	Weed	
Myrtaceae	*Taxandria juniperina*		
Orchidaceae	*Microtis media* subsp. *media*		
Oxalidaceae	*Oxalis pes-caprae*	Weed	
Papaveraceae	*Fumaria muralis* subsp. *muralis*	Weed	
Phytolaccaceae	*Phytolacca octandra*	Weed	
Pittosporaceae	*Billardiera fusiformis*		
Plantaginaceae	*Plantago* sp.	Weed	
Poaceae	*Avena barbata*	Weed	
Poaceae	*Briza maxima*	Weed	
Poaceae	*Briza minor*	Weed	
Poaceae	*Cenchrus clandestinus*	Weed	
Poaceae	*Cortaderia selloana*	Weed	
Poaceae	*Cynodon dactylon*	Weed	
Poaceae	*Lagurus ovatus*	Weed	
Poaceae	*Lolium* sp.	Weed	
Poaceae	*Polypogon monspeliensis*	Weed	
Poaceae	*Stenotaphrum secundatum*	Weed	
Polygonaceae	*Rumex acetosella*	Weed	
Primulaceae	*Lysimachia arvensis*	Weed	
Proteaceae	*Hakea florida*		
Rhamnaceae	*Spyridium globulosum*		
Rosaceae	*Rubus ulmifolius*	Weed	
Rubiaceae	*Coprosma repens*	Weed	
Salicaceae	*Salix babylonica*	Weed	
Solanaceae	*Physalis peruviana*	Weed	

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Family	Taxon	Status	Notes
Solanaceae	*Solanum laciniatum*	Weed	
Solanaceae	*Solanum nigrum*	Weed	
Tamaricaceae	*Tamarix aphylla*	Declared Pest - s22(2)	
Tropaeolaceae	*Tropaeolum majus*	Weed	
Typhaceae	*Typha orientalis*		

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Appendix D Site-Species Matrix

	Taxon	R01	R02	R03	Opp
*	*Centella asiatica*			+	
*	*Lemna minor*				+
*	*Zantedeschia aethiopica*	+		+	
*	*Asparagus asparagoides*				+
*	*Yucca aloifolia*				+
*	*Cirsium vulgare*				+
*	*Cotula coronopifolia*				+
*	*Erigeron bonariensis*				+
*	*Hypochaeris glabra*				+
*	*Sonchus asper*				+
	Lobelia anceps				+
	Chenopodiaceae sp.		+		
	Rhagodia baccata subsp. *baccata*	+			
	Tecticornia ?indica subsp. *bidens*		+		
	Threlkeldia diffusa		+		
*	*Crassula glomerata*		+		
*	Cupressaceae sp.				+
	Ficinia nodosa				+
	Isolepis cernua var. *setiformis*				+
	Isolepis prolifera			+	+
	Lepidosperma gladiatum				+
	Machaerina articulata				+
	Machaerina juncea				+
	Pteridium esculentum	+			
	Hibbertia cuneiformis				+
*	*Euphorbia paralias*		+		+
	Acacia littorea				+
*	*Acacia longifolia* subsp. *longifolia*				+
*	*Dipogon lignosus*				+
*	*Lotus subbiflorus*				+
*	*Psoralea pinnata*				+
*	*Geranium molle*	+			
*	*Pelargonium capitatum*	+	+		+
*	*Watsonia meriana*				+
	Juncus ?kraussii subsp. *australiensis*		+		
*	*Juncus oxycarpus*				+
	Juncus pallidus				+
*	*Stachys arvensis*		+		

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	Taxon	R01	R02	R03	Opp
*	*Lagunaria patersonia*				+
	Agonis flexuosa	+			+
*	*Callistemon* sp.				+
	Eucalyptus ?conferruminata				+
	Eucalyptus cornuta				+
*	*Eucalyptus globulus*	+			
	Eucalyptus gomphocephala var. *gomphocephala*	+			
*	*Eucalyptus petiolaris*			+	
*	*Gaudium laevigatum*		+		+
*	*Lophostemon confertus*				+
	Melaleuca rhaphiophylla			+	+
*	*Metrosideros* sp.				+
	Taxandria juniperina				+
	Microtis media subsp. *media*				+
*	*Oxalis pes-caprae*				+
*	*Fumaria muralis* subsp. *muralis*				+
*	*Phytolacca octandra*				+
	Billardiera fusiformis				+
*	*Plantago* sp.				+
*	*Avena barbata*	+	+		+
*	*Briza maxima*				+
*	*Briza minor*				+
*	*Cenchrus clandestinus*	+			
*	*Cortaderia selloana*				+
*	*Cynodon dactylon*		+		
*	*Lagurus ovatus*		+		+
*	*Lolium* sp.				+
*	*Polypogon monspeliensis*				+
*	*Stenotaphrum secundatum*	+	+		
*	*Rumex acetosella*				+
*	*Lysimachia arvensis*				+
	Hakea florida				+
	Spyridium globulosum				+
*	*Rubus ulmifolius*				+
*	*Coprosma repens*				+
*	*Salix babylonica*				+
*	*Physalis peruviana*				+
*	*Solanum laciniatum*				+
*	*Solanum nigrum*				+
*	*Tamarix aphylla*				+

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	Taxon	R01	R02	R03	Opp
*	*Tropaeolum majus*				+
	Typha sp.				+

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Appendix E Site Data

Project: 65310 **Date:** 2023-10-25

Site: R01 **Coordinates:** -35.025593, 117.859817 **Datum:** GDA94 **Site Type:** Releve

Site Size: 10 x 10 m **Site Marker:** No marker (temporary site) **Photo Location:** Centre

Landform: dune **Aspect:** n/a **Slope:** 0

Outcropping: no **Rock Type:** Nil

Soil Type: **Soil Notes:** Light grey brown sand

Surface: 1% bare ground, 0% outcropping, 2% litter **Years Since Fire:** yrs

Large Trees Present (>500 mm DBH): yes

Condition: Completely Degraded **Disturbance Notes:** Parkland cleared, weeds

Vegetation Description: *Eucalyptus cornuta* and **Eucalyptus globulus* over *Agonis flexuosa* over *Pteridium esculentum*, **Stenotaphrum secundatum*, **Cenchrus clandestinus* and **Pelargonium capitatum*

Taxon	Height (cm)	Cover (%)	Cover (Dead %)	Comment
* *Eucalyptus globulus*	1500	60		
Eucalyptus gomphocephala var. *gomphocephala*	1500	5		
* Cupressaceae sp.	900			Opp coll
Agonis flexuosa	800	20		
Rhagodia baccata subsp. *baccata*	120			Opp coll
Pteridium esculentum	100	3		
* *Cenchrus clandestinus*	100	3		
* *Stenotaphrum secundatum*	100	80		
* *Pelargonium capitatum*	80	5		
* *Avena barbata*	70	0.5		
* *Zantedeschia aethiopica*	25	0.05		
* *Geranium molle*	5	0.001		
Hibbertia cuneiformis				Opp coll
Machaerina juncea				Opp coll
Acacia littorea				Opp coll
Billardiera fusiformis				Opp coll
* *Psoralea pinnata*				Opp coll

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	Hakea florida	Opp coll
	Lepidosperma gladiatum	Opp coll
*	*Briza maxima*	Opp coll
	Ficinia nodosa	Opp coll
*	*Asparagus asparagoides*	Opp coll
	Spyridium globulosum	Opp coll
*	*Briza minor*	Opp coll
*	*Cortaderia selloana*	Opp coll
*	*Metrosideros* sp.	Opp coll
*	*Physalis peruviana*	Opp coll
*	*Leptospermum laevigatum*	Opp coll
*	*Tamarix aphylla*	Opp coll
*	*Euphorbia paralias*	Opp coll
*	*Lagurus ovatus*	Opp coll
*	*Lagunaria patersonia*	Opp coll

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Project: 65310 **Date:** 2023-10-25

Site: R02 **Coordinates:** -35.027226, 117.864242 **Datum:** GDA94 **Site Type:** Releve

Site Size: 10 x 10 m **Site Marker:** No marker (temporary site) **Photo Location:** Centre

Landform: depression/ basin **Aspect:** South-east **Slope:** 5

Outcropping: no **Rock Type:** Laterite breakwater

Soil Type: **Soil Notes:** Loamy mud

Surface: 30% bare ground, 0% outcropping, 5% litter **Years Since Fire:** yrs

Large Trees Present (>500 mm DBH): no

Condition: Degraded **Disturbance Notes:** Weeds

Vegetation Description: *Juncus ?krausii* over *Threlkeldia diffusa* and *Tecticornia ?indica*

	Taxon	Height (cm)	Cover (%)	Cover (Dead %)	Comment
*	*Gaudium laevigatum*	200	1		
	Juncus ?kraussii subsp. *australiensis*	100	20		
*	*Avena barbata*	45	0.1		
	Threlkeldia diffusa	30	5		
*	*Euphorbia paralias*	30	0.5		
*	*Lagurus ovatus*	20	0.01		
*	*Pelargonium capitatum*	20	0.1		
	Tecticornia ?indica subsp. *bidens*	20	30		
*	*Stachys arvensis*	15	0.001		
	Chenopodiaceae sp. (sterile)	15	0.25		
*	*Stenotaphrum secundatum*	10	0.5		
*	*Cynodon dactylon*	5	2		
*	*Crassula glomerata*	3	0.01		
*	*Phytolacca octandra*				Opp coll
*	*Solanum laciniatum*				Opp coll
*	*Rubus ulmifolius*				Opp coll
*	*Lophostemon confertus*				Opp coll
	Eucalyptus ?conferruminata				Opp coll - behind fence
*	*Dipogon lignosus*				Opp coll

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Project: 65310 **Date:** 2023-10-27

Site: R03 **Coordinates:** -35.024270, 117.860263 **Datum:** GDA94 **Site Type:** Releve

Site Size: 10 x 10 m **Site Marker:** No marker (temporary site) **Photo Location:** Centre

Landform: depression/ basin **Aspect:** n/a **Slope:** 0

Outcropping: no **Rock Type:** Nil

Soil Type: **Soil Notes:** Obscured

Surface: 0% bare ground, 0% outcropping, 100% litter **Years Since Fire:** yrs

Large Trees Present (>500 mm DBH): yes

Condition: Very Good **Disturbance Notes:** Weeds

Vegetation Description: *Melaleuca rhaphiophylla* over *Isolepis prolifera, *Zantedeschia aethiopica* and **Centella asiatica*

Taxon		Height (cm)	Cover (%)	Cover (Dead %)	Comment
	Melaleuca rhaphiophylla	800	95		
*	*Zantedeschia aethiopica*	100	0.5		
	Isolepis prolifera	25	5		
*	*Centella asiatica*	20	0.1		
	Taxandria juniperina				Opp coll
*	*Acacia longifolia* subsp. *longifolia*				Opp coll
	Typha sp.				In drain
*	*Tropaeolum majus*				Opp coll
*	*Fumaria muralis* subsp. *Muralis*				Opp coll
*	*Juncus oxycarpus*				Opp coll
*	*Eucalyptus petiolaris*				Opp coll

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Appendix F Fauna Report

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Albany
2023 Fauna Assessment

Prepared by: J. Turpin
Kingfisher Environmental
Mundaring, WA 6073

October 2023

Categories Used in the Assessment of Conservation Status.

IUCN categories as used for the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Biodiversity Conservation Act 2016*.

CATEGORY	DEFINITION
Extinct	Taxa not definitely located in the wild during the past 50 years.
Extinct in the Wild	Taxa known to survive only in captivity.
Critically Endangered	Taxa facing an extremely high risk of extinction in the wild in the immediate future.
Endangered	Taxa facing a very high risk of extinction in the wild in the near future.
Vulnerable	Taxa facing a high risk of extinction in the wild in the medium-term future.
Near Threatened	Taxa that risk becoming Vulnerable in the wild.
Conservation Dependent	Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classed as Vulnerable or more severely threatened.
Data Deficient (Insufficiently Known)	Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.
Least Concern	Taxa that are not Threatened.

Definitions of relevant categories under the EPBC Act 1999.

CATEGORY	DEFINITION
Endangered (EN)	The species is likely to become extinct unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate; or its numbers have been reduced to such a critical level, or its habitats have been so drastically reduced, that it is in immediate danger of extinction.
Vulnerable (VU)	Within the next 25 years, the species is likely to become endangered unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate.
Migratory (M)	Species are defined as migratory if they are listed in an international agreement approved by the Commonwealth Environment Minister, including: • the Bonn Convention ((Convention on the Conservation of Migratory Species of Wild Animals) for which Australia is a range state;

	• The Agreement between the Government of Australia and the Government of the Peoples Republic of China for the Protection of Migratory Birds and their Environment (CAMBA); or • The Agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA).

Categories used in the Biodiversity Conservation Act 2016.

CATEGORY	DEFINITION
Critically Endangered	Facing an extremely high risk of extinction in the wild in the immediate future.
Endangered	Facing a very high risk of extinction in the wild in the near future.
Vulnerable	Facing a high risk of extinction in the wild in the medium-term future.
Extinct	There is no reasonable doubt that the last individual has died. A species is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the species' life cycle and life form.
Extinct in the wild	It is known only to survive in cultivation, in captivity or as a naturalised population (or populations) well outside the past range. A species is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the species' life cycle and life form
Special Conservation Interest	It is of special conservation interest because it - (i) has a naturally low population range; or (ii) has a restricted natural range; or (iii) is subject to or recovering from a significant population decline or reduction in natural range Conservation dependent species – that is species that have previously been listed as threatened, but have recovered to the extent that they no longer meet the criteria for threatened, and the species is dependent on conservation actions continuing, i.e. the species is the focus of a specific conservation programme, the cessation of which would result in it again becoming eligible for listing as a threatened species within a period.
Migratory	A native species is eligible for listing in the category of migratory if: (i) Members of the species periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or (ii) the species is the subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth. International agreements that apply to the listing of a species as a migratory species are: Japan - Australia Migratory Birds Agreement (JAMBA); China - Australia Migratory Birds Agreement (CAMBA); Republic of Korea - Australia Migratory Birds Agreement (ROKAMBA); and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn).
Species otherwise in need of special protection	A species that is otherwise in need of special protection if it does not meet any of the above criteria, but is a species for which a need for special protection exists.

Department of Biodiversity, Conservation and Attractions Priority Fauna Species (species not listed under the BC Act, but for which there is some concern).

CATEGORY	DEFINITION
Priority One (P1)	Poorlyknown species. Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g., agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
Priority Two (P2)	Poorly known species. Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g., national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
Priority Three (P3)	Poorly known species. Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
Priority Four (P4)	Rare, Near Threatened and other species in need of monitoring: (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for Vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Fauna recorded during the assessment.

73 species recorded, including 66 from within the project area during the assessment on the 25th and 26th October 2023. Three cameras set 25th and collected 28th October and bird surveys conducted throughout and on adjacent mudflats, over two consecutive mornings and afternoons. Targeted searching for sign of significant fauna was conducted throughout, and also when the Western Ringtail Possum was identified, a wider transect was searched to identify the species presence.

Fauna Recorded (X) from the Survey Area (Tables 1 to 4).

TABLE 1. Frogs recorded during the survey

Common Name	Species Name	Status	Survey Area
PELODRYADIDAE			
Slender Tree Frog	*Litoria adelaidensis*		X
Motorbike Frog	*Litoria moorei*		X
MYOBATRACHIDAE			
Rattling Froglet	*Crinia glauerti*		X
Total Number of Species: 3			**3**

TABLE 2. Reptiles recorded during the survey

Common Name	Species Name	Status	Survey Area
SCINCIDAE			
King's Skink	*Egernia kingii*		X
Total Number of Species: 1			1

TABLE 3. Birds recorded during the survey

Common Name	Species Name	Status	Survey Area
ANATIDAE			
Australian Wood Duck	*Chenonetta jubata*		X
Pacific Black Duck	*Anas superciliosa*		X
Chestnut Teal	*Anas castanea*		X
ANHINGIDAE			
Darter	*Anhinga melanogaster*		
COLUMBIDAE			
Common Bronzewing	*Phaps chalcoptera*		X
Feral Pigeon	*Columba livia*		X
ARDEIDAE			
White-faced Heron	*Egretta novaehollandiae*		X
Eastern Great Egret	*Ardea alba*	M	
PHALACROCORACIDAE			
Little Pied Cormorant	*Phalacrocorax melanoleucos*		
Pied Cormorant	*Phalacrocorax varius*		
Little Black Cormorant	*Phalacrocorax sulcirostris*		
Great Cormorant	*Phalacrocorax carbo*		
PELECANIDAE			
Australian Pelican	*Pelecanus conspicillatus*		
Threskiornithidae			
Australian White Ibis	*Threskiornis moluuca*		X
Yellow-billed Spoonbill	*Platalea flavipes*		
ACCIPITRIDAE			
Eastern Osprey	*Pandion haliaetus*	M	X
Whistling Kite	*Haliastur sphenurus*		X
Swamp Harrier	*Circus approximans*		X
RALLIDAE			
Purple Swamphen	*Porphyrio porphyrio*		X
HAEMATOPODIDAE			
Pied Oystercatcher	*Haematopus longirostris*		X
CHARADRIIDAE			
Red-capped Plover	*Charadrius ruficapillus*		X
Grey Plover	*Pluvialis squatarola*	M	
SCOLOPACIDAE			
Red-necked Stint	*Calidris ruficollis*	M	X
Common Sandpiper	*Actitis hypoleucos*	M	
LARIDAE			
Silver Gull	*Larus novaehollandiae*		X

Common Name	Species Name	Status	Survey Area
Pacific Gull	*Larus pacificus*	Ma	
Caspian Tern	*Hydroprogne caspia*	IA	
Crested Tern	*Thalasseus bergii*	MI	
Fairy Tern	*Sternula nereis*	V	
CACATUIDAE			
Galah	*Eolophusroseicapillus*		X
Red-tailed Black-Cockatoo	*Calyptorhynchus banksii*	V	
PSITTACIDAE			
Purple-crowned Lorikeet	*Glossopsitta porphyrocephala*		X
Australian Ringneck	*Barnardius zonarius*		X
Red-capped Parrot	*Purpureicephalus spurius*		X
Western Rosella	*Platycercus icterotis*		X
CUCULIDAE			
Shining Bronze Cuckoo	*Chalcites lucidus*		X
Fan-Tailed Cuckoo	*Cacomantis flabelliformis*		X
MALURIDAE			
Splendid Fairy-wren	*Malurus splendens*		X
Red-winged Fairywren	*Malurus elegans*		X
Southern Emu-wren	*Stipiturus malachurus*		X
ACANTHIZIDAE			
Weebill	*Smicrornis brevirostris*		X
Spotted Scrubwren	*Sericornis maculatus*		X
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*		X
PARDALOTIDAE			
Spotted Pardalote	*Pardalotus punctatus*		X
MELIPHAGIDAE			
Singing Honeyeater	*Gavicalis virescens*		X
Red Wattlebird	*Anthochaera carunculata*		X
Brown Honeyeater	*Lichmera indistincta*		X
New Holland Honeyeater	*Phylidonyris novaehollandiae*		X
CAMPEPHAGIDAE			
Black-faced Cuckoo-shrike	*Coracinanovaehollandiae*		X
PACHYCEPHALIDAE			
Golden Whistler	*Pachycephala pectoralis*		X
Grey Shrike-thrush	*Colluricincla harmonica*		X
ARTAMIDAE			
Grey Butcherbird	*Cracticustorquatus*		X
Australian Magpie	*Cracticustibicen*		X

Common Name	Species Name	Status	Survey Area
RHIPIDURIDAE			
Grey Fantail	*Rhipidura albiscapa*		X
Willie Wagtail	*Rhipidura leucophrys*		X
CORVIDAE			
Australian Raven	*Corvus coronoides*		X
MONARCHIDAE			
Magpie-lark	*Grallina cyanoleuca*		X
MEGALURIDAE			
Little Grassbird	*Poodytes gramineus*		
HIRUNDINIDAE			
Welcome Swallow	*Hirundo neoxena*		X
Fairy Martin	*Petrochelidon ariel*		X
ESTRILDIDAE			
Red-eared Firetail	*Stagonopleura oculata*		X
ZOSTEROPIDAE			
Silvereye	*Zosterops lateralis*		X
Total Number of Species: 62		10	55

TABLE 4. Mammals recorded during the survey

Common Name	Species Name	Status	Survey Area
PERAMELIDAE			
Quenda, Southern Brown Bandicoot	*Isoodon obesulus*	P4	X
PSEUDOCHEIRIDAE			
Western Ringtail Possum	*Pseudocheirus occidentalis*	CE	X
MACROPODIDAE			
Western Grey Kangaroo	*Macropus fuliginosus*		X
INTRODUCED MAMMALS			
Dog	*Canis lupus*		X
Feral Cat	*Felis catus*		X
Rabbit	*Oryctolagus cuniculus*		X
Black Rat	*Rattus rattus*		X
Total Number of Native Species: 3		**2**	**3**
Total Number of Introduced Species: 4			**4**

Details of Survey Methodology

Location of Motion-activated Cameras installed during the survey

Camera Name	Datum	Latitude	Longitude	Habitat
1	GDA2020	-35.0243271	117.8619259	Densely vegetated drainage
2	GDA2020	-35.0251351	117.8608117	Peppermint thicket
3	GDA2020	-35.0265703	117.8599226	Peppermint thicket

Species recorded on camera

Common Name	Species Name	Status	Cameras
King's Skink	*Egernia kingie*		3
Quenda	*Isoodon obesulus*		1
Black Rat	*Rattus rattus*		2
Feral Cat	*Felis catus*		1
Rabbit	*Oryctolagus cuniculus*		1

Locations of Conservation Significant Fauna

Table 1. Species of Conservation Significance Recorded

Species	Status	latitude	longitude	Comments
Fairy Tern	V	-35.0303653	117.8581854	Four birds seen foraging
Great Egret	MA	-35.0298255	117.8554567	1 bird seen foraging
Caspian Tern	IA	-35.0277998	117.8622792	2 birds seen
Greater Crested Tern (Crested	MI	-35.0310682	117.8546606	2 birds seen
Common Sandpiper	IA	-35.0273543	117.864434	1 bird seen
Common Sandpiper	IA	-35.0274499	117.863672	1 bird seen
Grey Plover	IA	-35.0303653	117.8581854	1 bird seen
Grey Plover	IA	-35.0277575	117.8623883	2 birds seen
Grey Plover	IA	-35.0284805	117.8598714	2 birds seen
Red-necked Stint	IA	-35.0277831	117.8583951	65 birds seen foraging
Red-necked Stint	IA	-35.0271031	117.8589219	43 birds seen foraging
Red-necked Stint	IA	-35.0274163	117.8623124	24 birds seen foraging
Red-necked Stint	IA	-35.027521	117.8607744	24 birds seen foraging
Red-necked Stint	IA	-35.0310682	117.8546606	90 birds seen foraging
Red-necked Stint	IA	-35.0269708	117.8595234	12 birds seen foraging
Eastern Osprey	M	-35.0275286	117.8580417	1 birds seen foraging
Western Ringtail Possum	CE	-35.0265703	117.8599226	5 Dreys seen in one tree
Western Ringtail Possum	CE	-35.0255424	117.8639863	Drey in tree
Western Ringtail Possum	CE	-35.029568	117.8546286	Drey in tree
Western Ringtail Possum	CE	-35.0354676	117.8497851	Drey in tree
Western Ringtail Possum	CE	-35.029992	117.8537088	Drey in tree
Western Ringtail Possum	CE	-35.0293693	117.8551888	Drey x 2 in tree
Western Ringtail Possum	CE	-35.0300893	117.8533328	Drey in tree
Western Ringtail Possum	CE	-35.0319361	117.8515157	Scat
Western Ringtail Possum	CE	-35.0264899	117.8594427	Scat
Western Ringtail Possum	CE	-35.0258597	117.8598088	Scat
Western Ringtail Possum	CE	-35.0263057	117.8640448	Scat
Western Ringtail Possum	CE	-35.0274053	117.861443	Scat
Western Ringtail Possum	CE	-35.027406	117.8619878	Scat
Western Ringtail Possum	CE	-35.0275575	117.8621045	Scat
Western Ringtail Possum	CE	-35.0272934	117.8599411	Scat
Western Ringtail Possum	CE	-35.0273965	117.8600244	Scat
Western Ringtail Possum	CE	-35.0274872	117.8601975	Scat
Western Ringtail Possum	CE	-35.0273926	117.8603149	Scat
Western Ringtail Possum	CE	-35.0274287	117.8604358	Scat
Western Ringtail Possum	CE	-35.0273755	117.8614482	Scat
Western Ringtail Possum	CE	-35.0247213	117.862659	Scat
Western Ringtail Possum	CE	-35.0248351	117.861119	Scat
Western Ringtail Possum	CE	-35.0252257	117.8605794	Scat
Western Ringtail Possum	CE	-35.0251351	117.8608117	Scat
Western Ringtail Possum	CE	-35.0251565	117.860755	Scat
Western Ringtail Possum	CE	-35.0251282	117.8608611	Scat
Western Ringtail Possum	CE	-35.0248763	117.8612651	Scat
Western Ringtail Possum	CE	-35.0248132	117.8612014	Scat
Quenda	P4	-35.0264899	117.8594427	Scat
Quenda	P4	-35.0236365	117.861398	Dig
Quenda	P4	-35.0247977	117.8625677	Dig
Quenda	P4	-35.0252001	117.8606372	Dig
Quenda	P4	-35.0243271	117.8619259	One observed
Red-tailed Black Cockatoo	V	-35.026393	117.865626	Heard adjacent

Note: status refers to conservation status

Broad Fauna habitats recorded during the assessment.

Landform	Vegetation	Inside survey area	Comments
Mudflats and shoreline	None	Intertidal area	Wader habitat
Freshwater and Brackish Wetlands	Reeds / Sedges and fringing riparian	Yes	Waterbirds and frogs, Chestnut Teal breeding
Drainage line	Yate and Peppermint thickets over sedges and mixed shrubs	Yes	Habitat for Western Ringtail Possum and Quenda
Damplands	Melaleuca preissiana and Peppermint Woodland	Yes	Habitat for Western Ringtail Possum and Quenda
Damplands	Mixed native and introduced species	Yes	Quenda occur
Disturbed	Pasture, introduced weeds and native speces	Yes	Quenda occur

Notes:

The mudflats appear important for waders with close to 100 Red-necked Stints recorded adjacent to the survey area. Greater Sand Plover, Red Knot, Ruddy Turnstone, Pacific Golden Plover, Bar-tailed Godwit and Great Knot all recorded nearby within 5 km (Little Grove-Rushy Point) during September and October 2023 – see EBird. This area has mudflat connectivity with the project – see satellite imagery.

Appendix G PMST Search

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Australian Government

Department of Climate Change, Energy, the Environment and Water

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 27-Jun-2024

Summary

Details

- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat

Acknowledgements

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	75
Listed Migratory Species:	64

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	16
Commonwealth Heritage Places:	None
Listed Marine Species:	91
Whales and Other Cetaceans:	14
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	20
Regional Forest Agreements:	None
Nationally Important Wetlands:	1
EPBC Act Referrals:	27
Key Ecological Features (Marine):	None
Biologically Important Areas:	9
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name	Buffer Status
Commonwealth Marine Areas (EPBC Act)	In buffer area only

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Empodisma peatlands of southwestern Australia	Endangered	Community likely to occur within area	In feature area
Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia	Endangered	Community may occur within area	In buffer area only
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area	In buffer area only

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Aphelocephala leucopsis			
Southern Whiteface [529]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Ardenna grisea			
Sooty Shearwater [82651]	Vulnerable	Species or species habitat may occur within area	In feature area
Arenaria interpres			
Ruddy Turnstone [872]	Vulnerable	Roosting known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Roosting known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris tenuirostris Great Knot [862]	Vulnerable	Roosting known to occur within area	In feature area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area	In feature area
Cereopsis novaehollandiae grisea Cape Barren Goose (south-western), Recherche Cape Barren Goose [25978]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area	In feature area
Dasyornis longirostris Western Bristlebird [515]	Endangered	Species or species habitat likely to occur within area	In feature area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Endangered	Species or species habitat known to occur within area	In feature area
Limosa limosa Black-tailed Godwit [845]	Endangered	Roosting known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Phaethon rubricauda westralis](#) Red-tailed Tropicbird (Indian Ocean), Indian Ocean Red-tailed Tropicbird [91824]	Endangered	Species or species habitat may occur within area	In feature area
[Phoebetria fusca](#) Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
[Pluvialis squatarola](#) Grey Plover [865]	Vulnerable	Roosting known to occur within area	In feature area
[Psophodes nigrogularis nigrogularis](#) Western Heath Whipbird [64449]	Endangered	Species or species habitat likely to occur within area	In buffer area only
[Pterodroma mollis](#) Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Sternula nereis nereis](#) Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
[Thalassarche carteri](#) Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Thalassarche cauta](#) Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
[Thalassarche impavida](#) Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
[Thalassarche melanophris](#) Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
[Thalassarche steadi](#) White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Tringa nebularia			
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area	In feature area
Xenus cinereus			
Terek Sandpiper [59300]	Vulnerable	Roosting known to occur within area	In feature area
Zanda baudinii listed as Calyptorhynchus baudinii			
Baudin's Cockatoo, Baudin's Black-Cockatoo, Long-billed Black-cockatoo [87736]	Endangered	Breeding known to occur within area	In feature area
Zanda latirostris listed as Calyptorhynchus latirostris			
Carnaby's Black Cockatoo, Short-billed Black-cockatoo [87737]	Endangered	Breeding known to occur within area	In feature area
FISH			
Nannatherina balstoni			
Balston's Pygmy Perch [66698]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Thunnus maccoyii			
Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat known to occur within area	In feature area
INSECT			
Trioza barrettae			
Banksia brownii plant louse [87805]	Endangered	Species or species habitat known to occur within area	In feature area
MAMMAL			
Balaenoptera borealis			
Sei Whale [34]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Balaenoptera musculus			
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In feature area
Balaenoptera physalus			
Fin Whale [37]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Dasyurus geoffroii			
Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Eubalaena australis](#) Southern Right Whale [40]	Endangered	Breeding known to occur within area	In feature area
[Neophoca cinerea](#) Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat may occur within area	In feature area
[Parantechinus apicalis](#) Dibbler [313]	Endangered	Species or species habitat known to occur within area	In feature area
[Pseudocheirus occidentalis](#) Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat known to occur within area	In feature area
OTHER			
[Westralunio carteri](#) Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
PLANT			
[Banksia brownii](#) Brown's Banksia, Feather-leaved Banksia [8277]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Banksia goodii](#) Good's Banksia [16727]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
[Banksia verticillata](#) Granite Banksia, Albany Banksia, River Banksia [8333]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Caladenia granitora](#) [65292]	Endangered	Species or species habitat may occur within area	In feature area
[Caladenia harringtoniae](#) Harrington's Spider-orchid, Pink Spider-orchid [56786]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Calectasia cyanea](#) Blue Tinsel Lily [7669]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Chordifex abortivus Manypeaks Rush [64868]	Endangered	Species or species habitat known to occur within area	In feature area
Conostylis misera Grass Conostylis [21320]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Diuris drummondii Tall Donkey Orchid [4365]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat known to occur within area	In feature area
Isopogon uncinatus Albany Cone Bush, Hook-leaf Isopogon [20871]	Endangered	Species or species habitat known to occur within area	In feature area
Kennedia glabrata Northcliffe Kennedia [16452]	Vulnerable	Species or species habitat may occur within area	In feature area
Microtis globula South-Coast Mignonette Orchid [6780]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Sphenotoma drummondii Mountain Paper-heath [21160]	Endangered	Species or species habitat may occur within area	In feature area
Verticordia fimbrilepis subsp. australis Southern Shy Featherflower [24630]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
REPTILE			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area	In feature area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Dermochelys coriacea			
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area
SHARK			
Carcharias taurus (west coast population)			
Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Carcharodon carcharias			
White Shark, Great White Shark [64470]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Galeorhinus galeus			
School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark [68453]	Conservation Dependent	Species or species habitat may occur within area	In buffer area only
Rhincodon typus			
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area

Listed Migratory Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Ardenna carneipes			
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Breeding known to occur within area	In feature area
Ardenna grisea			
Sooty Shearwater [82651]	Vulnerable	Species or species habitat may occur within area	In feature area
Diomedea antipodensis			
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea dabbenena			
Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In feature area
Hydroprogne caspia Caspian Tern [808]		Breeding known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Onychoprion anaethetus Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Thalassarche melanophris](#) Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
[Thalassarche steadi](#) White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In feature area
Migratory Marine Species			
[Balaenoptera borealis](#) Sei Whale [34]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Balaenoptera edeni](#) Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
[Balaenoptera musculus](#) Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In feature area
[Balaenoptera physalus](#) Fin Whale [37]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Caperea marginata](#) Pygmy Right Whale [39]		Species or species habitat may occur within area	In feature area
[Carcharhinus longimanus](#) Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area	In feature area
[Carcharodon carcharias](#) White Shark, Great White Shark [64470]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area	In feature area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Breeding known to occur within area	In feature area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area	In feature area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area	In feature area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area	In feature area
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat known to occur within area	In feature area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat known to occur within area	In feature area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area
Migratory Terrestrial Species			
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Arenaria interpres Ruddy Turnstone [872]	Vulnerable	Roosting known to occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Roosting known to occur within area	In feature area
Calidris alba Sanderling [875]		Roosting known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area	In feature area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area	In feature area
Calidris tenuirostris Great Knot [862]	Vulnerable	Roosting known to occur within area	In feature area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area	In feature area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area	In buffer area only
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
Limosa limosa Black-tailed Godwit [845]	Endangered	Roosting known to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area	In buffer area only
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area	In feature area
Pandion haliaetus Osprey [952]		Breeding known to occur within area	In feature area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area	In feature area
Pluvialis squatarola Grey Plover [865]	Vulnerable	Roosting known to occur within area	In feature area
Thalasseus bergii Greater Crested Tern [83000]		Breeding known to occur within area	In buffer area only
Tringa brevipes Grey-tailed Tattler [851]		Roosting known to occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area	In feature area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area	In feature area
Xenus cinereus Terek Sandpiper [59300]	Vulnerable	Roosting known to occur within area	In feature area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Defence		
Defence - ALBANY TRAINING DEPOT [50137]	WA	In buffer area only
Defence - ALBANY TRAINING DEPOT [50136]	WA	In buffer area only
Defence - ALBANY TRAINING DEPOT ; AIRTC ALBANY [50116]	WA	In buffer area only
Defence - ALBANY TRAINING DEPOT ; AIRTC ALBANY [50115]	WA	In buffer area only
Unknown		
Commonwealth Land - [51033]	WA	In buffer area only
Commonwealth Land - [51034]	WA	In buffer area only
Commonwealth Land - [51035]	WA	In buffer area only
Commonwealth Land - [51036]	WA	In buffer area only
Commonwealth Land - [51038]	WA	In buffer area only
Commonwealth Land - [51398]	WA	In buffer area only
Commonwealth Land - [51017]	WA	In buffer area only
Commonwealth Land - [52149]	WA	In buffer area only
Commonwealth Land - [51399]	WA	In buffer area only
Commonwealth Land - [51032]	WA	In buffer area only
Commonwealth Land - [50308]	WA	In buffer area only
Commonwealth Land - [51030]	WA	In buffer area only

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Breeding known to occur within area	In feature area
Ardenna grisea as Puffinus griseus Sooty Shearwater [82651]	Vulnerable	Species or species habitat may occur within area	In feature area
Arenaria interpres Ruddy Turnstone [872]	Vulnerable	Roosting known to occur within area	In feature area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Roosting known to occur within area	In feature area
Calidris alba Sanderling [875]		Roosting known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area overfly marine area	In feature area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Calidris tenuirostris](#) Great Knot [862]	Vulnerable	Roosting known to occur within area overfly marine area	In feature area
[Cereopsis novaehollandiae grisea](#) Cape Barren Goose (south-western), Recherche Cape Barren Goose [25978]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
[Chalcites osculans as Chrysococcyx osculans](#) Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area	In buffer area only
[Charadrius bicinctus](#) Double-banded Plover [895]		Roosting known to occur within area overfly marine area	In feature area
[Charadrius leschenaultii](#) Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Charadrius mongolus](#) Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area	In feature area
[Charadrius ruficapillus](#) Red-capped Plover [881]		Roosting known to occur within area overfly marine area	In feature area
[Chroicocephalus novaehollandiae as Larus novaehollandiae](#) Silver Gull [82326]		Breeding known to occur within area	In buffer area only
[Diomedea antipodensis](#) Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
[Diomedea dabbenena](#) Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area	In feature area
[Diomedea epomophora](#) Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In feature area
Eudyptula minor Little Penguin [1085]		Breeding known to occur within area	In buffer area only
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area overfly marine area	In buffer area only
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area overfly marine area	In buffer area only
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area overfly marine area	In feature area
Hydroprogne caspia as Sterna caspia Caspian Tern [808]		Breeding known to occur within area	In feature area
Larus pacificus Pacific Gull [811]		Breeding known to occur within area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
Limosa limosa Black-tailed Godwit [845]	Endangered	Roosting known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area overfly marine area	In buffer area only
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area	In feature area
Onychoprion anaethetus as Sterna anaethetus Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area	In feature area
Pandion haliaetus Osprey [952]		Breeding known to occur within area	In feature area
Pelagodroma marina White-faced Storm-Petrel [1016]		Breeding known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area	In feature area
Pluvialis squatarola Grey Plover [865]	Vulnerable	Roosting known to occur within area overfly marine area	In feature area
Pterodroma macroptera Great-winged Petrel [1035]		Breeding known to occur within area	In buffer area only
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Puffinus assimilis Little Shearwater [59363]		Breeding known to occur within area	In buffer area only
Recurvirostra novaehollandiae Red-necked Avocet [871]		Roosting known to occur within area overfly marine area	In feature area
Stercorarius antarcticus as Catharacta skua Brown Skua [85039]		Species or species habitat may occur within area	In buffer area only
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalasseus bergii as Sterna bergii Greater Crested Tern [83000]		Breeding known to occur within area	In buffer area only
Thinornis cucullatus as Thinornis rubricollis Hooded Plover, Hooded Dotterel [87735]		Species or species habitat known to occur within area overfly marine area	In feature area
Tringa brevipes as Heteroscelus brevipes Grey-tailed Tattler [851]		Roosting known to occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area overfly marine area	In feature area
Xenus cinereus Terek Sandpiper [59300]	Vulnerable	Roosting known to occur within area overfly marine area	In feature area
Fish			
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area	In feature area
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area	In feature area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area	In feature area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area	In feature area
Leptoichthys fistularius Brushtail Pipefish [66248]		Species or species habitat may occur within area	In feature area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area	In feature area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area	In feature area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area	In feature area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area	In feature area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area	In feature area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area	In feature area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area	In feature area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area	In feature area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area	In feature area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area	In feature area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area	In feature area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area	In feature area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area	In feature area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area	In feature area
Mammal			
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Breeding known to occur within area	In feature area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat may occur within area	In feature area
Reptile			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area	In feature area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area

Whales and Other Cetaceans [Resource Information]

Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area	In feature area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In feature area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area	In feature area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In feature area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area	In feature area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In feature area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area	In feature area

Current Scientific Name	Status	Type of Presence	Buffer Status
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area	In feature area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In feature area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In feature area

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Bakers Junction	Nature Reserve	WA	In buffer area only
Bon Accord Road	Nature Reserve	WA	In buffer area only
Down Road	Nature Reserve	WA	In buffer area only
Eclipse Island	Nature Reserve	WA	In buffer area only
Gledhow	Nature Reserve	WA	In buffer area only
Green Island	Nature Reserve	WA	In buffer area only
Gull Rock	National Park	WA	In buffer area only
Lake Powell	Nature Reserve	WA	In buffer area only
Marbelup	Nature Reserve	WA	In buffer area only
Mill Brook	Nature Reserve	WA	In buffer area only
Mistaken Island	Nature Reserve	WA	In buffer area only
Mount Mason	Nature Reserve	WA	In buffer area only
Seal Island (WA32199)	Nature Reserve	WA	In buffer area only
Torndirrup	National Park	WA	In buffer area only
Unnamed WA23088	Conservation Park	WA	In buffer area only

Protected Area Name	Reserve Type	State	Buffer Status
Unnamed WA23923	Nature Reserve	WA	In buffer area only
Unnamed WA32478	5(1)(h) Reserve	WA	In buffer area only
Unnamed WA33308	5(1)(h) Reserve	WA	In buffer area only
Voyagers Park	5(1)(h) Reserve	WA	In buffer area only
West Mount Mason	Nature Reserve	WA	In buffer area only

Nationally Important Wetlands

[Resource Information]

Wetland Name	State	Buffer Status
Oyster Harbour	WA	In buffer area only

EPBC Act Referrals

[Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Sydney Street Subdivision	2023/09530		Completed	In buffer area only
Controlled action				
Albany Heritage Park Link Trail, WA	2019/8480	Controlled Action	Assessment Approach	In buffer area only
Albany Heritage Park Trail Network Concept Plan	2017/7943	Controlled Action	Completed	In buffer area only
Albany Port Authority dredging project	2006/2540	Controlled Action	Post-Approval	In buffer area only
Albany Ring Road Stages 2 and 3B, WA	2020/8769	Controlled Action	Post-Approval	In feature area
Bayonet Head Residential Development, Albany, WA	2015/7624	Controlled Action	Further Information Request	In buffer area only
Emu Point Residential Area Project	2010/5479	Controlled Action	Completed	In buffer area only
Southdown Magnetite Mine	2006/2544	Controlled Action	Completed	In feature area
Not controlled action				
Albany Motorsport Park, 20kms Northwest Albany, WA	2021/8944	Not Controlled Action	Completed	In buffer area only
Albany Port Maintenance Dredging, Albany, WA	2014/7246	Not Controlled Action	Completed	In buffer area only
Anzac Centre Develpment, Albany, WA	2012/6571	Not Controlled Action	Completed	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Anzac Interpretive Centre Development, Albany, WA	2013/6903	Not Controlled Action	Completed	In buffer area only
Development of Grasmere Wind Farm	2008/4368	Not Controlled Action	Completed	In buffer area only
Engineered Strand Lumber Plant	2007/3421	Not Controlled Action	Completed	In buffer area only
Eradication of the European House Borer, Perth metropolitan area, WA	2009/5027	Not Controlled Action	Completed	In buffer area only
Firebreak Creation, Kalgan, WA	2020/8681	Not Controlled Action	Completed	In buffer area only
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
Mount Barker to Albany Water Supply Pipeline	2013/6720	Not Controlled Action	Completed	In buffer area only
Prescribed burn of Cells 5, 6 & 8 of Crown Land Reserve 35381, Napier, WA	2013/6798	Not Controlled Action	Completed	In buffer area only
Protected Harbour Development	2006/3091	Not Controlled Action	Completed	In buffer area only
Scuttling of the HMAS Perth	2001/171	Not Controlled Action	Completed	In buffer area only
Seismic Survey, Bremer Basin, Mentelle Basin and Zeewyck Sub-basin	2004/1700	Not Controlled Action	Completed	In feature area
South Coast Highway Widening 8.2-14.16 SLK	2017/8009	Not Controlled Action	Completed	In buffer area only
Sth Coast Hwy Road Widening, Albany, WA	2018/8279	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Referral decision				
Albany Port Maintenance Dredging	2010/5527	Referral Decision	Completed	In buffer area only

Biologically Important Areas			[Resource Information]
Scientific Name	Behaviour	Presence	Buffer Status
Seabirds			
Ardenna carneipes			
Flesh-footed Shearwater [82404]	Foraging (in high numbers)	Known to occur	In buffer area only
Eudyptula minor			
Little Penguin [1085]	Foraging (provisioning young)	Known to occur	In feature area
Hydroprogne caspia			
Caspian Tern [808]	Foraging (provisioning young)	Known to occur	In feature area
Larus pacificus			
Pacific Gull [811]	Foraging (in high numbers)	Known to occur	In buffer area only
Onychoprion anaethetus			
Bridled Tern [82845]	Foraging (in high numbers)	Known to occur	In buffer area only
Puffinus assimilis tunneyi			
Little Shearwater [59363]	Foraging (in high numbers)	Known to occur	In buffer area only
Sternula nereis			
Fairy Tern [82949]	Foraging (in high numbers)	Known to occur	In buffer area only
Sharks			
Carcharodon carcharias			
White Shark [64470]	Foraging	Known to occur	In feature area
Whales			
Megaptera novaeangliae			
Humpback Whale [38]	Migration (north)	Known to occur	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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Larrakia Country | Suite G1, Level 1
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Melbourne
Kulin Country | Level 5, 10 Queen
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Awabakal/Worimi Country | 61 / 63
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