ENVIRONMENTAL MANAGEMENT PLAN

LOTS 167 (No.365), 204, 205, 206 & 207 (No.363) MALLOKUP ROAD AND LOTS 159, 168 & 203 LUDLOW ROAD NORTH, STIRLING ESTATE

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The preparation of this report has been undertaken and performed in a professional manner, in consideration of the scope of services and in accordance with environmental consulting practices. No other warranty is made.

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1 INTRODUCTION

1.1 Background

Dunkley Holdings Pty Ltd (the applicant) is proposing to extract sand and limestone from a 9.62 hectare (ha) area within Lots 167 (No. 365), 204, 205, 206 and 207 (No. 363) Mallokup Road and 159, 168 and 203 Ludlow Road North, Stirling Estate (herein referred to as the subject site) (refer to **Figure 1** and **2**).

This application is made for a five year period however, the exact life of the project is difficult to estimate as it will be dependent on supply and demand trends.

The available volume of sand and limestone (*insitu* volume of approximately 300,000 m^3) is to be extracted, commencing in the northeast of the subject site and move in a south westerly direction (refer to **Appendix A**).

This document has been submitted to fulfil the relevant requirements provided within the Shire of Capel's *Local Planning Scheme No. 8 (LPS),* the *Greater Bunbury Region Scheme (GBRS)* and the Shire of Capel's *Local Planning Policy No. 6.2 Extractive Industries*. It is intended to provide the Shire of Capel, the public and relevant government agencies with an understanding of the proposal and the environmental strategies and commitments proposed to address various environmental and social issues.

1.2 Location and Layout Plans

The subject site is located within Lots 167(No. 365), 204, 205, 206 and 207(No. 363) Mallokup Road and 159, 168 and 203 Ludlow Road North, Stirling Estate. All lots apart from Lot 203 Ludlow Road North, Stirling Estate are owned by Dunkley Holdings Pty Ltd. Lot 203 Ludlow Road North, Stirling Estate is owned by Alison Thelma Dunkley.

The subject site is zoned 'Priority Agriculture' pursuant to the Shire's *LPS No.* 8 and 'Rural' under the *GBRS*. The subject site has previously been used for agriculture.

Properties to the north and west are zoned 'Priority Agriculture' under *LPS No. 8* and 'Rural' under the *GBRS*. Beyond the properties to the west lies the Tuart Forest National Park, which also adjoins the subject site to the south and east and is zoned 'Public Open Space' under the *LPS No. 8* and 'Regional Open Space' and 'Rural' under the *GBRS*. Properties to the east are also zoned 'Priority Agriculture' under the *LPS No. 8*, and 'Regional Open Space' and 'Rural' under the *GBRS*.

Furthermore, pursuant to the *LPS No.8*, the subject site is also mapped as being located within the 'Special Control Area – Regional Ecological Linkages – SCA8 (Capel)'. The purpose of the SCA8 is 'To identify significant ecosystems on the Scheme Map as a Special Control Area and to provide measures to ensure that land use and development within its boundaries are regulated and managed to protect significant ecological linkages, foreshore environments, biodiversity and environmental quality'. The objectives of the SCA8 are:

(a) To provide a clear framework for how significant ecosystems are to be considered and protected under this Scheme;

(b) To assist in the protection and management of biodiversity and significant ecological linkages and their interactions with the nonliving elements of the ecosystems;

(c) To assist in the protection and managements of non-living elements of ecosystems and enhancement of air, soil and water quality and their interactions with the living elements of the ecosystems;

(d) To assist in the protection and management of foreshore environments and associated life, property and community infrastructure from impacts related to natural and/or man-made processes;

The subject site is located within the municipality of the Shire of Capel, approximately 3.8 km northwest of the Capel town centre and approximately 190 km south of Perth.

2 EXISTING ENVIRONMENT

2.1 Topography and Soils

The current topography of the subject site can be described as gently sloping with the elevation ranging from 5 m Australian Height Datum (AHD) in the southwest and centre to 1.5 m AHD in the north (refer to **Appendix A**).

The subject site is located within the Perth Coastal Zone within the Spearwood and Vasse Systems consisting of '*sand dunes and plains, yellow deep sands, pale deep sands and yellow/brown shallow sands*' and 'poorly drained estuarine flats, of the Swan Coastal Plain. Tidal flat soil, saline wet soil and pale deep sand,' respectively (Natural Resource Information (NRInfo).

The subject site is located within the following sub-systems (refer to **Figure 3**):

- Vasse Wonnerup wet flats phase- Poorly drained flats around the edge of the Vasse Estuary. Dark calcareous sands and mixed estuarine deposits; and
- Ludlow flats phase- Flats and very low dunes. Deep yellow brown siliceous sands over limestone (i.e. Spearwood Sands).

2.1.1 Acid Sulfate Soils

Acid Sulfate Soils (ASS) is the common name given to naturally occurring soil and sediment containing iron sulfides. They have become a potential issue in land development projects on the Swan Coastal Plain when the naturally anaerobic conditions in which they are situated are disturbed and they are exposed to aerobic conditions and subsequently oxidise. When oxidised, ASS produce sulfuric acid, which can result in a range of impacts to the surrounding environment. ASS that has oxidised and resulted in the creation of acidic conditions are termed "Actual ASS" (AASS), and those that have acid generating potential but remain in their naturally anaerobic conditions are termed "Potential ASS" (PASS).

ASS risk mapping (DWER 2021) indicates that there is a 'moderate to low risk' of ASS occurring within the northern and western extent of the subject site (refer to **Figure 4**). This proposal involves the excavation of material above the water table (at least 0.5 m separation to maximum groundwater levels will be maintained at all times) and no dewatering will be undertaken during excavation works. Accordingly, the potential impacts associated with ASS are expected to be low and therefore no further investigations regarding ASS are considered necessary.

2.2 Climate

The climate of the locality is classified as Mediterranean with warm to hot dry summers and cool wet winters.

The closest weather recording station is Bunbury (Station 9965). Temperatures are highest on average in February, at approximately 30.2°C. July has the lowest average temperature of the year of 7.4°C.

Rainfall at the closest weather recording station Capel North (Station 9992), is approximately 673 mm per annum with approximately 90% of the rain falling during the winter months, April to October inclusive.

During the summer months the dominant wind in the mornings is from the south-east at 17-18 knots, swinging to the south-west at approximately 22 knots in the afternoon. During winter, the winds are most commonly 12-19 knots from no dominant prevailing direction. During storms, winds from the west and north-west can reach 40 knots (BoM 2020).

Rainfall intensity has been calculated using the Bureau of Meteorology (BoM) Intensity-Frequency-Duration (IFD) data system which yields the two hour 1 in 10 (10%) annual exceedance probability storm event for the subject site as 41.3 mm/hr.

2.3 Vegetation and Flora

2.3.1 Flora

Given the condition of vegetation within the subject site and the current land use (livestock grazing and pasture), no flora of conservation significance is likely to occur.

Furthermore, a vegetation survey by Plantecology Consulting (2025) found the vegetation within the subject site to be in a 'Poor' condition (refer to **Plate 1**). The subject site is comprised of pasture areas that have been 'parkland cleared' apart from paddock trees consisting mainly of planted *Eucalyptus gomphocephala* (Tuart) and *Agonis flexuosa* (Peppermint). The landowner has advised that all remaining vegetation within the subject site has been planted and does not comply with the definition of 'native vegetation' pursuant to the *Environmental Protection Act 1986*.

Plate 1: Vegetation within the subject site. Condition is rated as 'Poor' with no native species present (Plantecology Consulting 2025).

2.3.2 Threatened Ecological Communities

An ecological community is defined as "a naturally occurring assemblage that occurs in a particular type of habitat" (PWS 2015). A Threatened Ecological Community (TEC) is one that has declined in area or was originally limited in distribution. Uncommon ecological communities that do not strictly meet TEC defined criteria, or are inadequately defined, are listed by the Department of Biodiversity, Conservation and Attractions (DBCA) as a Priority Ecological Community (PEC).

As well as protection under State legislation, selected ecological communities are also afforded statutory protection at a Federal level pursuant to the *Environment Protection and Biodiversity Conservation Act*

1999 (EPBC Act). The EPBC Act provides for the protection of TECs, which are listed under section 181 of the Act, and are defined as "Critically Endangered", "Endangered" or "Vulnerable" under Section 182.

A search of the DBCA's and EPBC Act databases found four TEC endorsed under State and Commonwealth legislation and policy recorded within proximity to the subject site. This was the *Empodisma* peatlands of southwestern Australia ecological community, Clay Pans of the Swan Coastal Plain, Banksia Woodlands of the Swan Coastal Plain ecological community and the Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain ecological community.

Surrounding the subject site to the east and south of the subject site is vegetation mapped as the Tuart Woodland TEC (Plantecology Consulting 2025). The vegetation survey determined that the subject site only captures approximately 1.3 ha of a patch of Tuart woodland TEC (with Stage 1). The patch that intersects the subject site is comprised of three planted Tuarts which comply with the diagnostic criteria associated with the federally listed Tuart Woodlands on the Swan Coastal Plan TEC, and therefore approval pursuant to the EPBC Act will be required for their removal.

2.3.3 Environmentally Sensitive Areas

Section 51B of the *Environmental Protection Act 1986* (EP Act) allows the Minister to declare an Environmentally Sensitive Area (ESA). Once declared, the exemptions to clear native vegetation under the regulations do not apply in these areas. TEC's areas within 50 m of any Declared Rare flora (DRF) and defined wetland areas constitute ESAs. However, a number of other areas of environmental significance are also listed. Current declared ESAs are listed in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*.

The subject site is mapped as occurring within an ESA. An ESA associated with the Summerlea (Dunkley's) Heritage Place (Heritage Place No. 14961) is mapped within the south of the subject site (refer to **Figure 5**).

2.4 Fauna

A search of the DBCA's Threatened Fauna database (Djandoo) was undertaken to establish whether species declared as 'Rare or likely to become extinct' (Schedule 1), 'Birds protected under an international agreement' (Schedule 3) and 'Other specially protected fauna' (Schedule 4) as listed under the *Biodiversity Conservation Act 2016* have been recorded in proximity to the subject site. The Djandoo Report identified 12 threatened species, one Priority 2 species, two Priority 3 species, five Priority 4 species and one 'Other specially protected fauna' species (refer to **Table 1**), within a 5 km radius of the subject site. A search of the EPBC Act *Matters of National Environmental Significance* database identified a further six species of conservation significant fauna species in proximity to the subject site.

Table 1: Significant fauna potentially occurring within proximity of the subject site as identified by State and Commonwealth database searches

Species	DBCA Status	EPBC Act Status	Likelihood of Occurrence
Anous tenuirostris melanops (Australian Lesser Noddy)		Vulnerable	Unlikely, based on absence of suitable habitat.
Bettongia penicillata ogilbyi (Woylie)	T		Unlikely, based on absence of suitable habitat.
Botaurus flavicollis australis (Australasian Bittern)	P2		Unlikely, based on absence of suitable habitat.

Species	DBCA Status	EPBC Act Status	Likelihood of Occurrence
Botaurus poiciloptilus (Australasian bittern)	T	Endangered	Unlikely, based on absence of suitable habitat.
Calidris ferruginea (Curlew sandpiper)	T		Unlikely, based on absence of suitable habitat.
Calyptorhynchus banksii naso (Forest Red-tailed Black-Cockatoo)	T	Vulnerable	Possible occurrence; no evidence recorded within the subject site during the fauna survey.
Dasyurus geoffroii (Chuditch)	T	Vulnerable	Unlikely, based on absence of suitable habitat.
*Falco hypoleucos (*Grey Falcon)		Vulnerable	Unlikely, based on absence of suitable habitat.
Falco peregrinus (Blue Petrel)	OS		Unlikely, based on absence of suitable habitat.
Falsistrellus mackenziei (Western False Pipistrelle)	P4		Unlikely, based on absence of suitable habitat.
*Geotria australis (*Pouched lamprey)	P3		Unlikely, based on absence of suitable habitat.
Hydromys chrysogaster (Rakali)	P4		Unlikely, based on absence of suitable habitat.
Halobaena caerulea (Blue Petrel)		Vulnerable	Unlikely, based on absence of suitable habitat.
*Isoodon fusciventer (*Southwestern Brown Bandicoot*)*	P4		Unlikely, based on absence of suitable habitat.
Limosa lapponica menzbieri (Northern Siberian Bar-tailed Godwit)		Endangered	Unlikely, based on absence of suitable habitat.
Notamacropus Irma (Western brush wallaby)	P4		Unlikely, based on absence of suitable habitat.
Numenius madagascariensis (Far Eastern curlew)	T		Unlikely, based on absence of suitable habitat.
Oxyura australis (Blue-billed duck)	P4		Unlikely, based on absence of suitable habitat.
Pachyptila turtur subantarctica (Fairy Prion (southern)		Vulnerable	Unlikely, based on absence of suitable habitat.
Phaethon rubricauda westralis (Red-tailed Tropicbird)		Endangered	Unlikely, based on absence of suitable habitat.
*Phascogale tapoatafa wambenger (*Brush-tailed phascogale*)*	T		Unlikely, based on absence of suitable habitat.
Pseudocheirus occidentalis (Western ringtail possum)	T	Critically endangered	Possible occurrence; no evidence recorded within the subject site during the fauna survey.
Pterodroma mollis (Soft-plumaged Petrel)		Vulnerable	Unlikely, based on absence of suitable habitat.
Setonix brachyurus (Quokka)	T	Vulnerable	Unlikely, based on absence of suitable habitat.
Sternula nereis nereis (Australian Fairy Tern)		Vulnerable	Unlikely, based on absence of suitable habitat.

Species	DBCA Status	EPBC Act Status	Likelihood of Occurrence
Thalassarche carteri (Indian yellow-nosed albatross)	T		Unlikely, based on absence of suitable habitat.
Tyto novaehollandiae (Australian masked owl)	P3		Unlikely, based on absence of suitable habitat.
Westralunio carteri (Carter's Freshwater Mussel)		Vulnerable	Unlikely, based on absence of suitable habitat.
Zanda baudinii (Baundins Cockatoo)	T	Endangered	Possible occurrence; no evidence recorded within the subject site during the fauna survey.
Zanda latirostris (Carnaby's Black Cockatoo)	T	Endangered	Possible occurrence; no evidence recorded within the subject site during the fauna survey.

While migratory bird species may infrequently visit the subject site, they will not rely on it for their persistence in consideration of its degraded condition. They have therefore been omitted from the list above.

Of the abovementioned conservation significant species, based on preferred habitat types, Western Ringtail Possums and the three Black Cockatoo species have the potential to occur within the subject site.

2.4.1 Black Cockatoos

The Forest Red-tailed Black Cockatoo occurs in the south-west of Western Australia, approximately southwest of a line between Gingin and the Green Range (near Wellstead, east of Albany). The range of this sub-species is closes associated with the distribution of Marri (*Corymbia calophylla*); its favoured nesting and foraging trees species. This species typically breeds in tree hollows with a depth of 1 – 5 m primarily in Marri (*Corymbia calophylla*) and Jarrah *(Eucalyptus marginata*).

The Forest Red-tailed Black Cockatoo (FRTBC) predominately forages on seeds of marri and jarrah. It has also been recorded foraging on *Eucalyptus caesia, E. erythrocorys*, river red gum (*E. camaldulensis*), flooded gum (*E. grandis*), *Allocasuarina* cones, fruits of snottygobble (*Personia longifolia*) and mountain marri (*Corymbia haematoxylon*) (SEWPaC 2012).

Carnaby's Black Cockatoo occurs in the south-west of Western Australia, approximately south-west of a line between the Murchison River (near Kalbarri) and Cape Arid National Park (east of Esperance).

Carnaby's Black Cockatoo generally nest in hollows in live or dead trees of Salmon Gum (*E. salmonophloia*), Wandoo (*E. Wandoo*), Tuart, Jarrah, Flooded Gum (*E. rudis*), York Gum (*E. loxophleba supsp. loxophleba*), Powderbark (*E. accedens*), Karri (*E. diversicolor*) and Marri (SEWPaC 2012).

Carnaby's Black Cockatoo forages in native shrubland, kwongan heathland and woodlands dominated by proteaceous plant species such as Banksia spp., Hakea spp. and Grevillea spp. (SEWPaC 2012).

Baudin's Black Cockatoo occurs in the south-west of Western Australia, approximately south-west of a line between Morangup (near Bullsbrook, north of Perth) and Waychinicup National Park (east of Albany). This species generally breeds in the Karri, Marri and Wandoo forests in the southern parts of the species' range and move north to the Darling Range and Swan Coastal Plain during autumn and winter.

During the breeding season, Baudin's Black Cockatoo primarily forage in Eucalypt woodlands, particularly Marri. Outside the breeding season, the species may feed in fruit orchards (mostly pear and apple, but also persimmon) and tips of Pinus spp. (SEWPaC 2012).

The following flora species are known to be or are potentially used as a direct food source (e.g. seeds, flowers, nectar, bark or grubs) by one or more species of Black Cockatoo and were recorded within the subject site:

- Peppermint - *Agonis flexuosa*;
- Tuart- *Eucalyptus gomphocephala*; and
- Planted non-endemic eucalypts (various unidentified species).

It should be noted that some of the above-mentioned species, while foraged upon (e.g. non-endemic eucalypts and peppermint) would make up only a small proportion of any one bird's diet relative to more favoured plant species such as marri.

The targeted fauna assessment (Harewood 2025) identified three planted trees within the subject site with a Diameter to Breast Height (DBH) greater than 50 centimetres (cm), one of these trees contained possible hollows but were considered unsuitable for Black Cockatoos. Additionally, there was no evidence of Black Cockatoos roosting within the trees located within the subject site. Overall, the foraging value of the subject site for Black Cockatoos can be regarded as being very low given the paucity of favoured foraged species (Harewood 2025).

Furthermore, available mapping indicates that there is approximately 7,000 ha of remnant native vegetation within a 12 km radius of the subject site. The majority of this is likely to contain 'potential' breeding habitat as defined by DCCEEW (i.e. suitable trees species with a DBH > 30cm) (Harewood 2025). On this basis, clearing three planted, potential habitat trees (without hollows), representing approximately 0.03 ha of highly degraded vegetation, would result in a 0.0004% reduction in potential Black Cockatoo habitat within a 12 km radius of the subject site (refer to **Figure 6**).

2.4.2 Western Ringtail Possums

The Western Ringtail Possum (WRP) is endemic to the south- west of Western Australia. It was formerly patchily distributed through the near-coastal southwest from approximately 120 km southeast of Geraldton to the southern edge of the Nullabor Plain and its range has now substantially contracted (How *et al.*, 1978, de Tores *et al*., 2005, Jones 2004). Extant populations now occur mostly on the coastal strip from Yalgorup (100km south of Perth) to Waychinicup National Park (just east of Albany), with isolated inland populations in the lower Collie River valley, Harvey River valley and at Perup (Manjimup) (de Tores *et al.*, 2005, Jones 2004, Jones 2007).

With the exception of the few isolated inland populations in Eucalypt forests, the WRP generally occurs in coastal Peppermint (*Agonis flexuosa*) woodlands, Peppermint/Tuart (*Eucalyptus gomphocephala*) woodlands, and Peppermint/Eucalypt woodlands associations, with the highest density populations occurring within the Busselton to Dunsborough coastal strip (*de Tores et al.*, 2005; Jones *et al.*, 2007).

The targeted fauna assessment conducted by Greg Harewood (2025) found no evidence of the WRP within the subject site. The habitat within the stage boundaries is relatively poor given the scattered nature of the trees and paucity of favoured plant species and only a small number of occasional transient WRP individuals are anticipated to occur, if only occasionally (Harewood 2025).

The presence of preferential foraging species within the subject site such as planted Peppermints represents potential WRP habitat, albeit marginal in quality due to the absence of canopy connectivity and understorey. The development footprint has been designed to avoid native vegetation as far as practicable, with only planted vegetation identified for removal. The subject site contains less than approximately 0.03ha of planted vegetation which provides potential WRP habitat that will be subject to removal (refer to **Figure 6**). Given the degraded nature of the vegetation and the absence of any evidence of WRP utilising

the vegetation as habitat (i.e. no scats, dreys or individuals), the vegetation is considered unlikely to be significant to the WRP population in the local area.

Additionally, available mapping indicates that there is approximately 435.7 ha of high suitability WRP habitat within a 2 km radius, the maximum home range of the WRP, of the subject site. On this basis, the removal of 0.03 ha of highly degraded planted vegetation will constitute a 0.007% reduction of potential high suitability WRP habitat within a 2 km radius of the subject site.

2.5 Hydrology

2.5.1 Groundwater

The subject site is located within the Busselton-Capel subarea of the *Rights in Water and Irrigation Act 1914* (RiWI Act) proclaimed Busselton-Capel Groundwater Area.

A groundwater monitoring programme was undertaken across the site during the winters of 2024 and 2025 (Hyd2o 2025), whereby five onsite monitoring bores and two external DWER bores were monitored over ten monitoring events (refer to **Appendix B**). Data from this monitoring showing that peak groundwater levels in winter 2024 and 2025 were above the long-term average, was used to produce average annual maximum groundwater levels (AAMGL) in m AHD for the site, taking into consideration annual variation over the last 25 years in the DWER bores. Contours produced from these values indicate an AAMGL of approximately 0.5 m AHD across the subject site.

Given the proposed maximum excavation level of 1 m AHD, at least 0.5 m separation to groundwater will be maintained at all times.

2.5.2 Surface Water

The subject site is located in the Capel River West Subarea of the RiWI Act proclaimed Capel River System Surface Water Area.

The subject site does not contain any surface water features. The closest surface water feature is the Capel River located approximately 580 m to the north of the subject site (refer to **Figure 7**).

The current water cycle within the subject site consists of inputs from rainwater flowing downhill in a north westerly direction into the wider drainage system. The development is not proposing to alter this process, as there are no drainage lines within the proposed extraction area.

2.5.3 Wetlands

Areas of wetlands in Western Australia have been mapped and this mapping has been converted into a digital dataset that is maintained by the DBCA and is referred to as the '*Geomorphic Wetlands of the Swan Coastal plain'* dataset. Multiple Use category wetlands are located approximately 285 m to the north, 661m to the west and 558 m to the east of the subject site (refer to **Figure 7**).

Additionally, a Conservation Category wetland is located approximately 480 m to the northwest of the subject site.

2.6 Aboriginal Heritage

All Aboriginal sites in Western Australia are provided protection under the *Aboriginal Heritage Act 1972* in which it is an offence for anyone to excavate, damage, destroy, conceal or in any way alter an Aboriginal site without the Minister's permission.

An online search for relevant Aboriginal heritage information was undertaken using the Department for Planning, Lands and Heritage *Aboriginal Cultural Heritage Inquiry System* that incorporates both the heritage site register and the heritage survey database (DPLH 2023). The Aboriginal Heritage Site Register is maintained pursuant to Section 38 of the *Aboriginal Heritage Act 1972* and contains information on over 22,000 listed Aboriginal sites throughout Western Australia.

Results of the database search revealed that no Aboriginal heritage sites are present within the subject site. The closest Aboriginal heritage site is the Capel River site (ID 20061) located approximately 580 m to the north of the subject site.

3 EXTRACTION ACTIVITIES

The sand and limestone quarry will cover an area of approximately 9.6 ha, with a current maximum elevation ranging from 5 to 1.5 m AHD. It will be excavated to an elevation of 1 m AHD commencing in the northeast and head in a south westerly direction. Extraction activities will be divided into five stages, each will be no greater than 2.0 ha in size (refer to **Appendix A**).

It is estimated that the total maximum volume of material to be removed will be approximately 300,000 m^3. Over a five year period, a maximum of approximately 60,000 m^3 will be excavated each year, depending on supply and demand.

Earthen bunds for noise mitigation will be constructed with topsoil and overburden that will be stripped from the extraction footprint and other areas on the northeastern boundary. Construction of the bunds will be undertaken with an excavator and loader.

The planned end use of the quarry is to restore a natural soil profile and return the extraction area to pasture, ensuring that there is no net loss of agricultural land.

3.1 Operational Works

Using a loader, the topsoil (where available) will be stripped and placed in stockpiles. Overburden, if present, will be removed using a dump truck and stockpiled to a convenient location within each extraction stage for operations.

In order to comply with noise regulations, the crusher may need to be positioned closer to the haulage route or a 3 m high bund (or shipping container) may need to be constructed adjacent to the crusher on the northwestern side of the subject site (SLR consulting 2026).

The material will be excavated by an excavator, bulldozer or loader to a stockpile or loaded directly to waiting trucks for transport. A summary of the proposed extraction activities is provided below:

- Excavation will commence in the northeast of the quarry and will move in a south westerly direction. The face and walls of the pit will act as noise barriers.
- Upon completion of each section of quarry, the section will be reformed and back filled using a combination of equipment such as a tracked bobcat, excavator and front-end loader, where subgrade material is available, to achieve the proposed final contours.
- At the end of excavation, the noise bunds will be removed, and the floor of the quarry will be deep ripped, covered by overburden and topsoil, and rehabilitated to a constructed soil.

3.1.1 Final Contours

The final surface contours of the quarry will be approximately 1 m AHD.

Slopes of the batters at the end of excavation will be retained at 1:6 vertical to horizontal (refer to **Appendix C**).

3.1.2 Rehabilitation

During operations, quarrying and rehabilitation of the extraction area will be undertaken progressively. Following quarrying of each stage, rehabilitation will be undertaken.

Upon completion of each stage, the following broad completion criteria will be achieved:

- A self-sustaining cover of pasture;

- Weed levels that are not likely to impact on the viability of the reconstructed soils; and
- A safe and stable landform suitable for the proposed future land use which will be productive, grazing pasturelands.

Rehabilitation is discussed in further detail in the *Rehabilitation Management Plan* prepared by Accendo Australia (2026).

3.2 Equipment

All operational equipment will work on the quarry floor to provide maximum sound and visual screening. All equipment and infrastructure will be fully portable to facilitate movement throughout the site required for staged quarrying operations. The site will be secured by locked gates when it is not being actively worked. The boundary fencing will be maintained to prevent inadvertent and unauthorised entry.

Equipment and facilities that may be used onsite are provided in the Table below.

Table 2. Equipment.

Equipment	Description
Site office and/or containers	May be required for the management and security of small items.
Toilet	A portable toilet may be required on site.
Watercart	Used for dust suppression on the access roads and working floors when required.
Bulldozer	Topsoil will be stripped using a bulldozer. Bulldozers will also be used for the movement of material and loading trucks.
Front End Loader	Loaders will be used for the movement of material and loading road trucks.
Excavator	An excavator may be used for the removal of material.
Mobile crushing and screening plant	Mobile crushing and screening plant (licensed by DWER) will be utilised for the processing of material. Mobile screening and crushing plants are to be used for the preparation of various grades of sand and limestone.
Fuel storage	No fuel will be stored onsite.
Light vehicles	Access to and around the site.
Truck	Transport of sand and limestone to crusher and removal of sand and limestone from site.

3.2.1 Water Usage

Water is only required for dust suppression within the quarry and the access road. Water will be sourced onsite from an existing bore. A DWER licence will be obtained for the extraction of water following approval.

4 SOCIAL IMPACTS

4.1 Receptors

The subject site has been designed to maximise setbacks to the closest sensitive receptors, where possible. This has involved extensive analysis of the local landform, environmental characteristics, land uses and location of sensitive receptors. The key amenity issues for sensitive premises associated with the proposal are:

- Visual amenity;
- Dust; and
- Noise.

The Environmental Protection Authority's (EPA) *Guidance for the Assessment of Environmental Factors* (June 2005) provides generic separation distances to assist in the determination of suitable buffers where industry may have the potential to affect the amenity of a sensitive land use. In particular, for extractive industries, a buffer distance of 300 m to 500 m is recommended from sensitive land uses. A conservative buffer of 500 m to sensitive receptors has been adopted for this proposal given that onsite screening and crushing is proposed.

The closest residential dwellings and other sensitive receptors to the subject site are provided below and shown in **Figure 8.**

Table 3. Residential dwellings within 1500 m of the subject site.

Address	Distance to subject site (m)
Lot 202 Ludlow North Road	162
Lot 202 Ludlow North Road	254
Housing Estate	260
Lot 51 Ludlow North Road	263
Lot 201 Ludlow North Road	395
Lot 50 Mallokup Road (Chalet accommodation)	540
Lot 52 Mallokup Road	680
Lot 123 Mallokup Road	991
228 Mallokup Road	1241

The closest residential dwelling to the subject site is located approximately 162 m to the northwest of the subject site. A housing estate consisting of 11 houses is located approximately 260 m from the subject site. Additionally, a short stay accommodation business is located approximately 540 m to the north of the subject site.

The *Environmental Noise Assessment* by SLR Consulting (2026) indicates that, across five assessed operational scenarios, predicted noise levels at the Receiver R-4 marginally exceed the assigned level. Although this exceedance is minor, it is noted that there are many practicable mitigation options if required. These options would include but are not limited to;

- Repositioning the crusher approximately 15 m to the east, closer to the haulage route; or
- Constructing a 3 m high bund or placing a shipping container adjacent to the crusher such that it screens noise from the crusher in the direction of the nearest noise sensitive receivers.

Management measures associated with noise and dust are discussed in further detail in **Sections 4.4** and **4.5**, respectively.

5 ENVIRONMENTAL IMPACTS AND MANAGEMENT

The following factors are considered to represent the potential environmental and amenity impacts associated with the proposal:

- Hydrology;
- Dust;
- Noise;
- Dieback and weeds; and
- Uncontrolled discharge of contaminants to land.

These environmental factors are discussed in more detail below, together with the proposed management actions.

5.1 Hydrology

5.1.1 Surface Water

The current water cycle within the subject site consists of inputs from rainwater flowing downhill towards the wider drainage system located to the north and west of the subject site. The development is not proposing to alter this process, as there are no drainage lines within the proposed extraction area.

A *Water Management Plan* has been prepared for the subject site and is provided in **Appendix D**. This Plan documents the proposed surface water management measures associated with the extractive industry operation.

5.1.2 Groundwater

Groundwater will not be extracted or dewatered during the operation of the quarry and therefore, no impacts to groundwater levels are proposed.

Maximum excavation levels will be to 5 m AHD. As discussed within **Section 2.5.1** no interaction with groundwater is expected during excavation works. Furthermore, a separation of at least 0.5 m, between the final contours and the maximum groundwater elevation will be maintained.

Accordingly, no impacts to groundwater are expected as a result of this proposal.

5.2 Vegetation and Fauna

As described in **Section 2.3**, the subject site has undergone historic disturbance and is currently comprised of open grassland with a relatively small number of planted Tuart and Peppermint trees (Harewood 2025).

The three planted tuarts in stage one comply with the diagnostic criteria associated with the federally listed Tuart Woodlands on the Swan Coastal Plan TEC, and therefore approval pursuant to the EPBC Act will be required for their removal.

No impacts to any flora or vegetation of conservation significance is proposed, as confirmed via a vegetation survey (Plantecology 2025).

No impacts to groundwater will result from the proposal and therefore any potential impacts to stygofauna or troglofauna are considered unlikely.

Three planted trees within the subject site with a DBH greater than 50 cm were identified, one of these trees contained possible hollows but were considered unsuitable for Black Cockatoos. Additionally, there was no evidence of Black Cockatoos roosting within the trees located within the subject site. Overall, the

foraging value of the subject site for Black Cockatoos can be regarded as being very low given the paucity of favoured foraged species (Harewood 2025).

Furthermore, available mapping indicates that there is approximately 7,000 ha of remnant native vegetation within a 12 km radius of the subject site. The majority of this is likely to contain 'potential' breeding habitat as defined by DCCEEW (i.e. suitable trees species with a DBH > 30cm) (Harewood 2025). On this basis, clearing three planted, potential habitat trees (without hollows), representing approximately 0.03 ha of highly degraded vegetation, would result in a 0.0004% reduction in potential Black Cockatoo habitat within a 12 km radius of the subject site.

The presence of preferential foraging species within the subject site such as planted Peppermint represents potential WRP habitat, albeit marginal in quality due to the absence of canopy connectivity and understorey. The subject site contains approximately 0.03 ha of native vegetation that provides potential habitat which will be removed. Given that this is a reduction of 0.007% of the WRP habitat within a 2 km radius, this is unlikely to be significant to the WRP population in the local area. Furthermore, no evidence of WRP utilising this vegetation for any purpose was recorded during the fauna survey (Harewood 2025).

In consideration of the above, no significant impacts to species of conservation significance are anticipated as a result of the proposal.

5.3 Dieback (*Phytophthora cinnamomi*)

Given that native vegetation has largely been altered within the subject site to enable the establishment of pasture, dieback indicator species are largely absent and therefore it is not possible to detect whether dieback is present or absent. On this basis, it is reasonable to classify the subject site as 'uninterpretable', denoting that a precautionary management approach should be adopted.

The primary objective of dieback management during operations is to minimise the risk of entry of dieback to the subject site. This can be achieved by preventing the importation of soil or plant material to and from the subject site. The risk of transportation via vehicles and equipment is low given that sealed roads will be utilised prior to entering the subject site.

The management measures proposed for dieback control are developed in accordance with the *Dieback Working Group (DWG) – Best Practice Guidelines* (DWG, 2005) for an uninterpretable site and are provided within **Table 4.**

Table 4. Dieback management measures.

Timing	Management Measures
Topsoil removal, excavation and rehabilitation activities	Training will be provided to all personnel during an initial safety and environment induction course. This will include an explanation of the specific requirements with regard to Phytophthora dieback management.
	Fencing and lockable gates will be maintained and used to control unauthorised access to the excavation area.
	As far as reasonable and practicable haulage vehicles are to be cleaned of all loose external soil and plant material prior to entry and exit from the extraction area.
	Access to the subject site during operation will be restricted to the proposed roads. No other access points should be established. The access location and vehicle inspection point should be clearly sign posted.
	The extraction area will be managed to avoid ponding of surface water where vehicle access is required.

Timing	Management Measures
	Trucks will be loaded and covered to ensure there is no spillage of material during transport.

A risk assessment to determine the residual risk associated with dieback is provided below. The risk assessment indicates that with the application of suitable management measures the potential risk associated with dieback introduction and spread is 'Low'.

Table 5. Risk assessment associated with dieback.

Hazard	Source of Hazard	Potential Impacts	Mitigation	Likelihood	Consequence	Residual Risk
Introduction/ spread of dieback	Importation of soil/plant material. Onsite movement of soil.	Impacts to the condition of remnant vegetation. Spread to offsite locations.	Refer to Management Measures provided in **Table 4**.	1	2	Low

5.4 Noise

Noise can originate from various operations and may impact on onsite workers, or travel offsite and impact nearby sensitive premises. Both potential noise impacts are addressed by reducing the noise generated from the quarrying and processing operations.

The proponent will ensure that all noise emissions comply with the requirements of the *Environmental Protection (Noise) Regulations 1997* at all times. A *Noise Management Plan* has been prepared for the subject site and is provided in **Appendix E**. This Plan documents the proposed noise management measures associated with the extractive industry operation.

5.5 Dust

The proposed extractive industry activities will involve the disturbance of large quantities of soil and earthen material. Specifically, this may include the following activities:

- Earthworks during extraction activities;
- Topsoil stripping;
- Loading and transportation of material;
- Crushing and screening of material;
- Vehicle movement within the site; and
- Wind erosion of exposed surfaces.

These activities have the potential to generate dust that, if not adequately controlled, can cause nuisance and safety risks. In-pit operations tend to generate less dust than surrounding activities due to the reduced airflow within the pit. The removal and replacement of topsoil material has the highest risk associated with dust generation due to the large volumes of material involved and generally lower levels of soil moisture.

A *Dust Management Plan* has been prepared for the subject site and is provided in **Appendix F**. This Plan documents the proposed dust management measures associated with the extraction industry operation.

5.6 Heritage Sites

A search of the DPLH *Aboriginal Cultural Heritage Inquiry System* shows no specific sites of Aboriginal significance occurring within or in proximity to the subject site. If during the course of mining an Aboriginal cultural heritage site is discovered, the proponent will immediately advise the DPLH and abide by the *Aboriginal Heritage Act 1972*.

5.7 Domestic and Industrial Waste Products

No domestic or industrial waste will be stored onsite. Any waste material generated during the operational activities will be taken offsite for disposal at an approved landfill facility on a daily basis. Hydrocarbon wastes such as accidental oil spills will be mopped up with absorbent material and segregated for removal and disposal offsite by a licensed contractor.

An approved portable toilet system may be temporarily placed onsite during construction activities. Waste from the toilet system will be disposed of offsite at an approved treatment facility.

5.8 Hydrocarbons and Dangerous Goods Management

Hydrocarbons are the only dangerous goods that will be utilised within the proposed extraction area. However, storage of hydrocarbons on the site will not occur.

Servicing of machinery and equipment will not occur onsite further reducing the possibility of contamination.

There is the minor possibility for soil and water contamination as a result of an incidental hydrocarbon leakages or spills during the operation of machinery. Accordingly, management measures for hydrocarbon spills are provided in the *Water Management Plan* (refer to **Appendix D**).

6 REHABILITATION

The end land use of the extraction area will be returned to pasture. Accordingly, it will be necessary to establish a safe and stable landform capable of supporting the proposed future land use.

A *Rehabilitation Management Plan* has been prepared for the subject site and is provided in **Appendix G**. This Plan documents the proposed rehabilitation management measures associated with the extraction industry operation.

REFERENCES

Churchward, H.M. and McArthur, W.M. (1978). Landforms and soils of the Darling System, Western Australia. In *'Atlas of Natural Resources, Darling System, Western Australia'*. Department of Conservation and Environment, Western Australia.

Department of Parks and Wildlife (DBCA) (2004). *Geomorphic Wetlands of the Swan Coastal Plain dataset*.

Department of Water (DoW) (2014). *South West Region Guideline, Water resource considerations for extractive industries.* DoW, Perth WA.

Dieback Working Group (DWG) (2004). *Managing Phytophthora Dieback: Guidelines for Local government.* Dieback Working Group, Western Australia.

Dieback Working Group (DWG) (2005). *Management of Phytophthora Dieback in Extractive Industries*. Dieback Working Group, Western Australia.

Environmental Protection Authority (EPA) (2006). *Guidance Statement No.10 for the Assessment of Environmental Factors (in accordance with the EP Act 1986: Levels of Assessment for Proposals Affecting Natural Areas Within the System 6 Region and Swan Coastal Plain Portion of the System 1 Region.*

Environmental Protection Authority (EPA) (2009). *South West Regional Ecological Linkages.* Bulletin No 8. Retrieved from: http://epa.wa.gov.au/EPADocLib/3040_SWREL_EPB821009.pdf

Harewood (2025) *Fauna Assessment 365 Mallokup Road, Stirling Estate Capel*, unpublished, Bunbury WA.

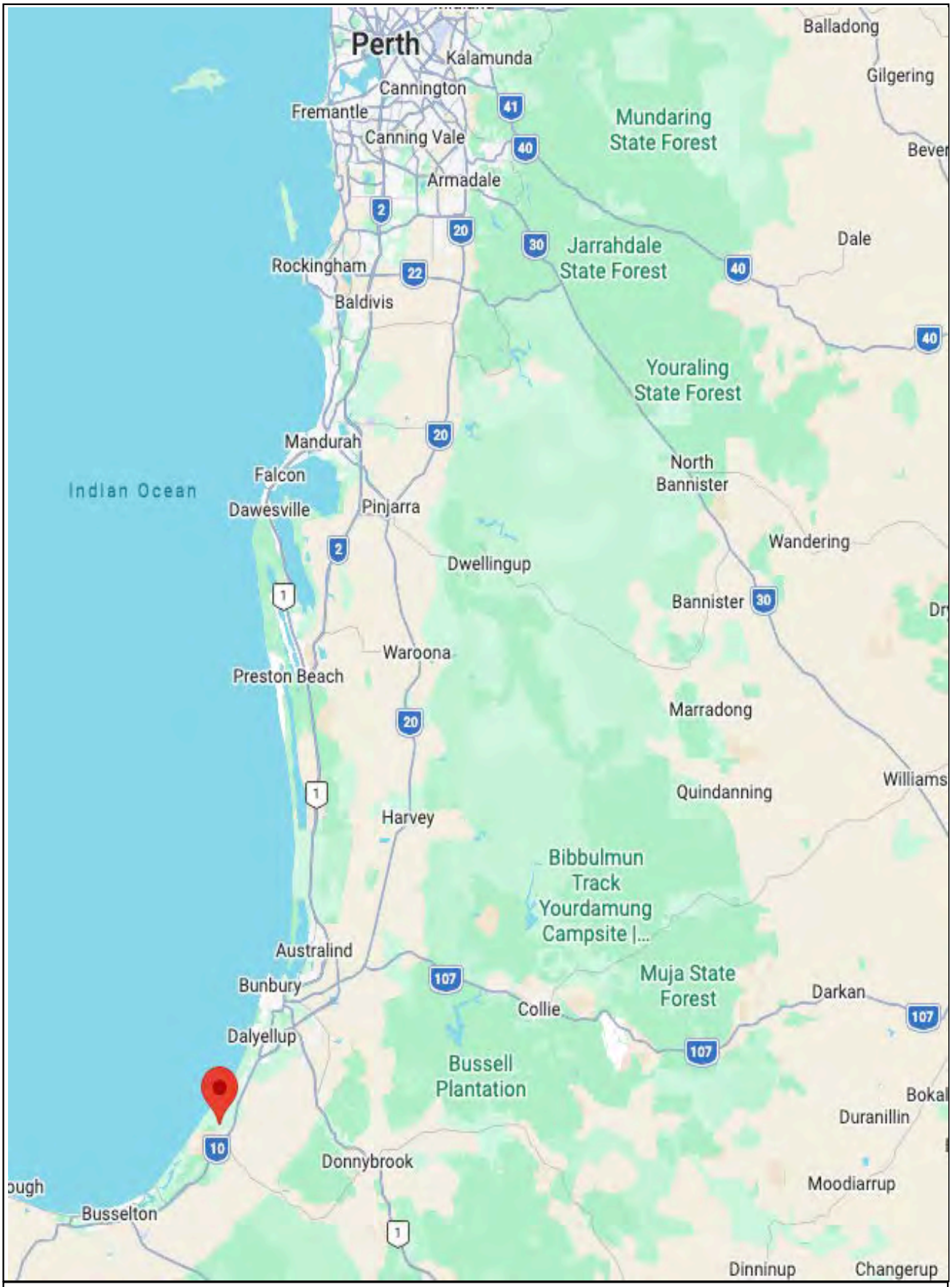
Plantecology Consulting (2025) *Stirling Estate Tuart Woodland Survey*, unpublished, Kinglsey, WA

SLR Consulting (2026) *Sand Extractive Industry Stirling Estate, Environmental Noise Assessment*, Subiaco, WA

Thackway, R, and Cresswell, ID, (Eds) (1995). *An Interim Biogeographic Regionalisation for Australia: a framework for establishing the national system of reserves*, Version 4.0. Australian Nature Conservation Agency, Canberra.

Western Australian Planning Commission (WAPC) (2007). *Planning Bulletin No. 64: Acid Sulfate Soils*, Western Australian Planning Commission, Western Australia.

FIGURES



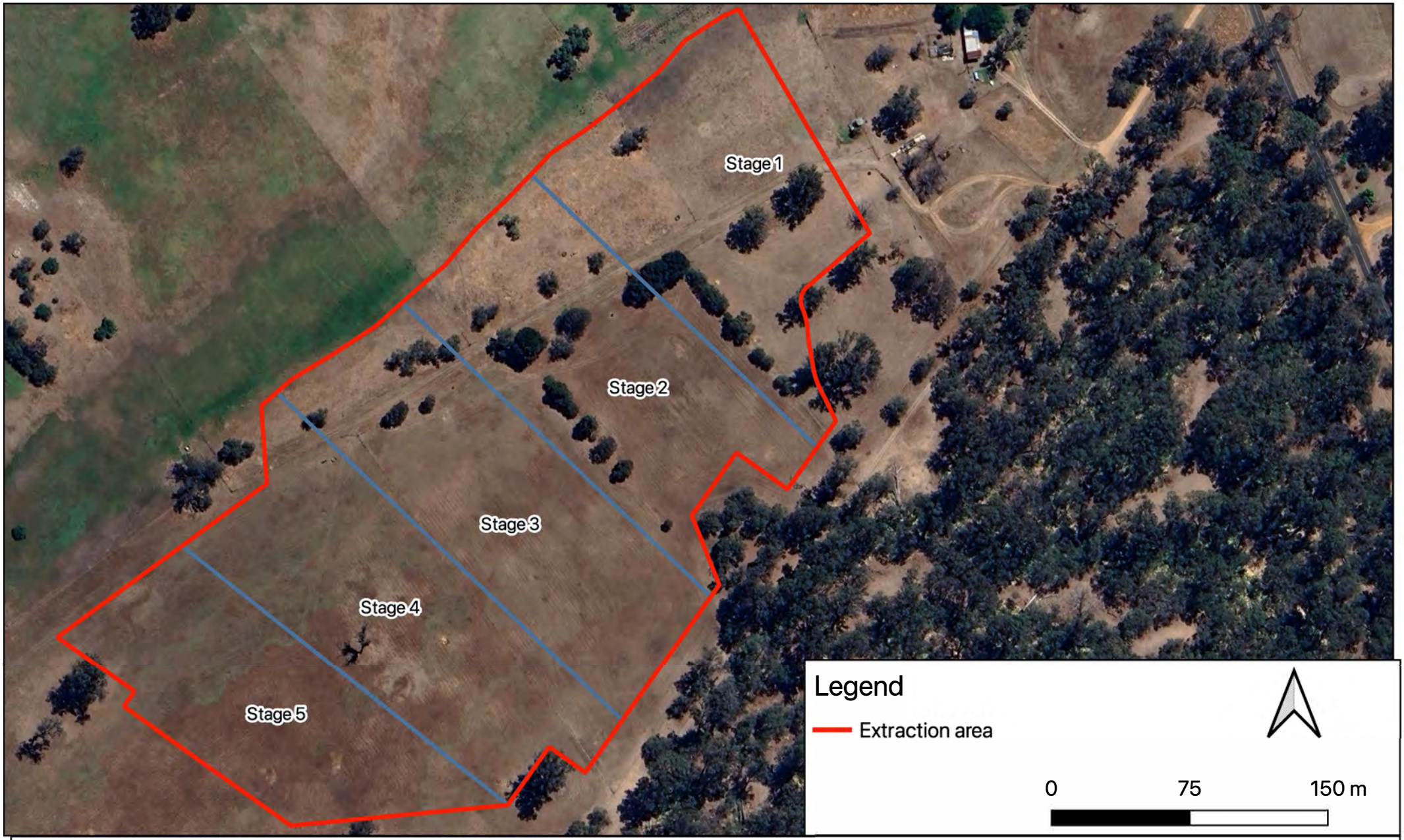
PROJECT	365 Mallokup Road,Stirling Estate
DRAWING TITLE	Figure 1 – Site Locality
CLIENT	Dunkley Holdings Pty Ltd

Project Number	Drawing Number	Revision
2573	Figure 1	A

Designed NC
Drawn PN
Checked
Approved

Date 08/04/2026
Local Authority Shire of Capel
Sheet 1 of 1

accendo AUSTRALIA
PO Box 5178
West Busselton
Western AUstralia
6280
Mobile 0418 950 852



PROJECT	365 Mallokup Road, Stirling Estate
DRAWING TITLE	Figure 2- Site Extent
CLIENT	Dunkley Holdings Pty Ltd

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Project Number	2573	Designed	NC
Drawing Number	Figure 2	Drawn	PN
Revision	A	Checked	
Date	05/05/2026	Approved	
Sheet 1 of 1		Local Authority	Shire of Capel

PROJECT	365 Mallokup Road, Stirling Estate
DRAWING TITLE	Figure 3- Soil Landscape Mapping
CLIENT	Dunkley Holdings Pty Ltd

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Project Number	2573	Designed	NC
Drawing Number	Figure 3	Drawn	PN
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Date	02/04/2026	Approved	
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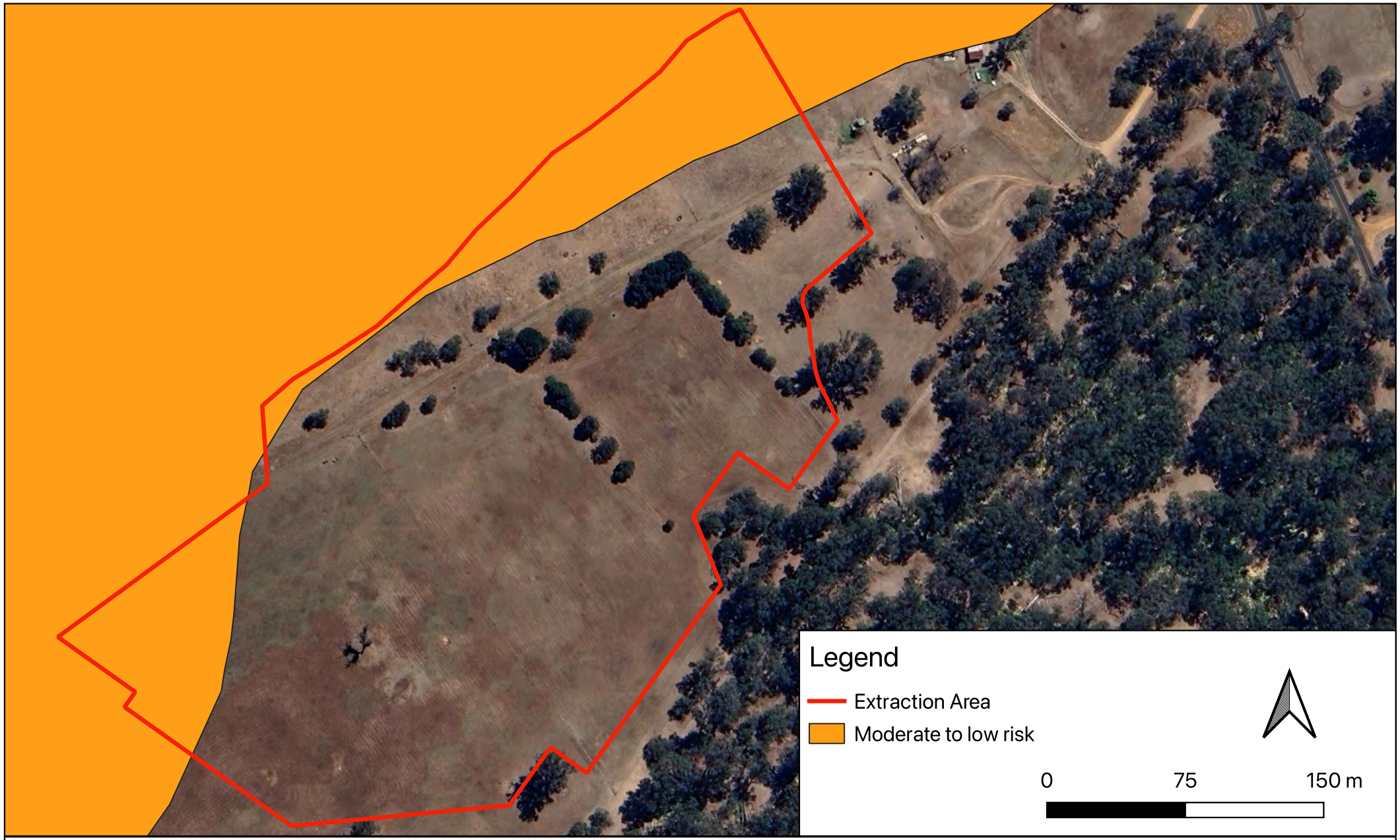

PROJECT 365 Mallokup Road, Stirling Estate

DRAWING TITLE Figure 4- Acid Sulfate Soils

CLIENT Dunkley Holdings Pty Ltd

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Project Number	2573	Designed	NC
Drawing Number	Figure 4	Drawn	PN
Revision	A	Checked	
Date	02/04/2026	Approved	
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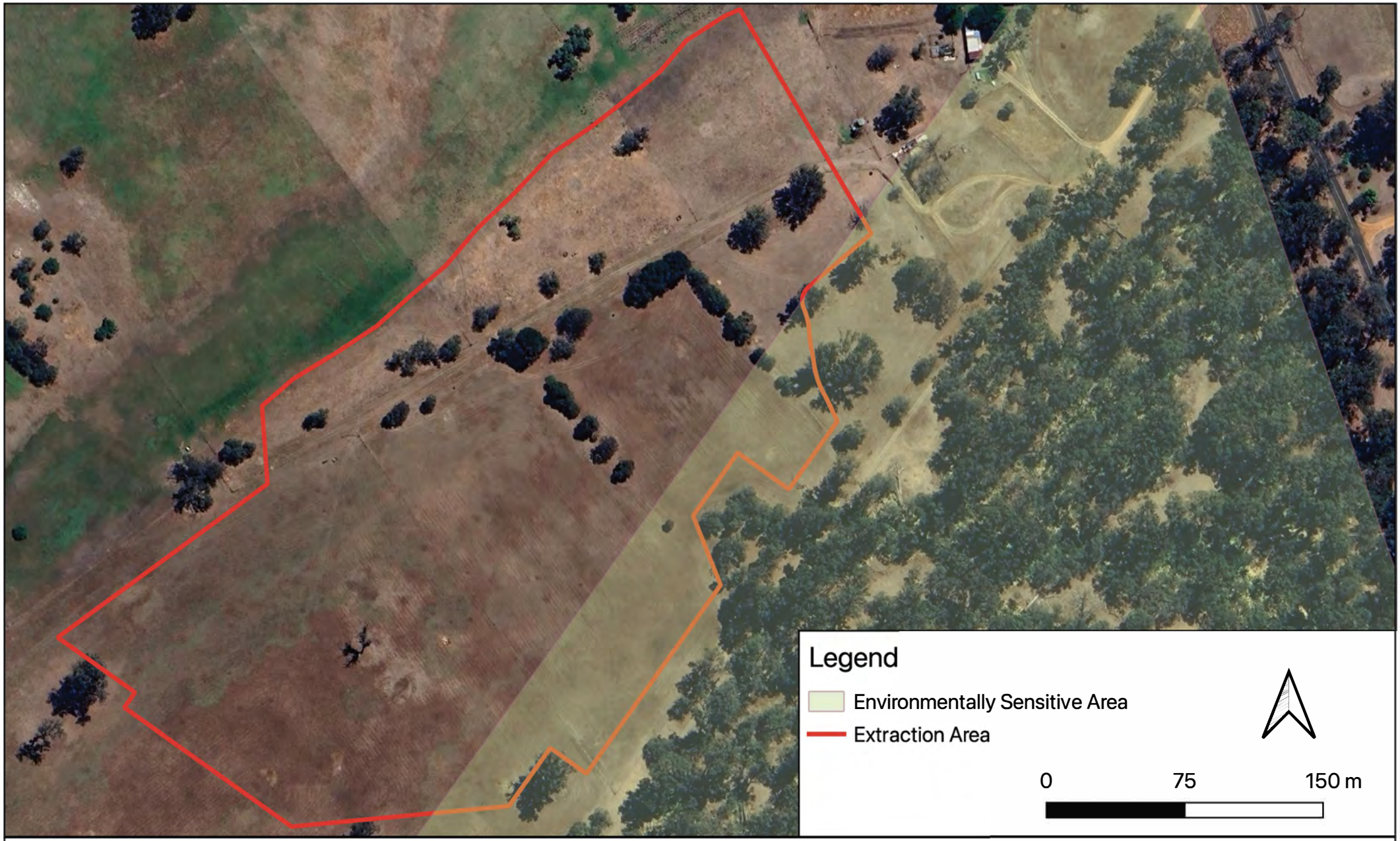

PROJECT	365 Mallokup Road, Stirling Estate
DRAWING TITLE	Figure 5- Envrionmentally Sensitive Area
CLIENT	Dunkley Holdings Pty Ltd

accendo AUSTRALIA
PO Box 5178
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Western Australia 6280
Mobile 0418 950 852

Project Number	2573	Designed	NC
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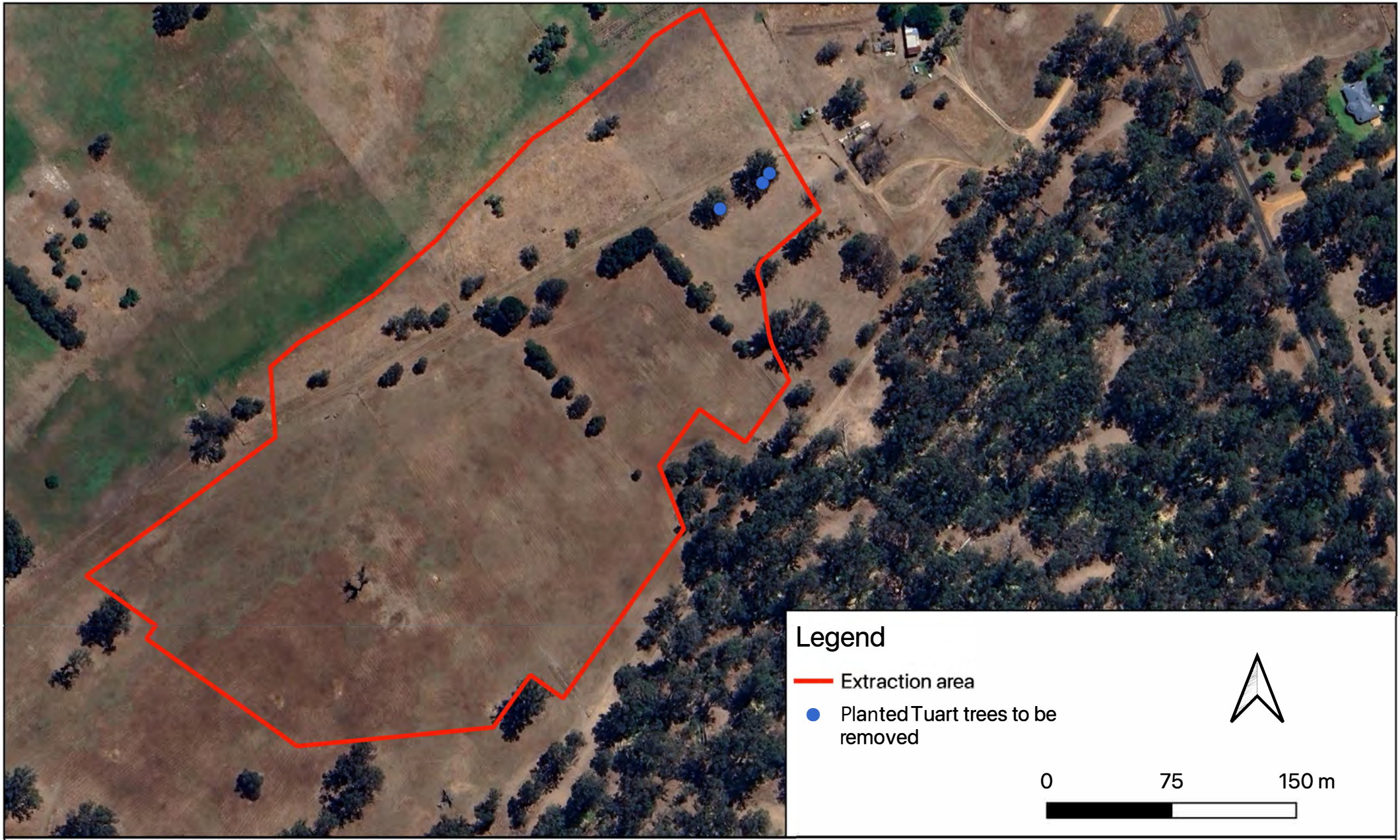
Revision	A	Checked	
Date	15/04/2026	Approved	
Sheet 1 of 1		Local Authority	Shire of Capel



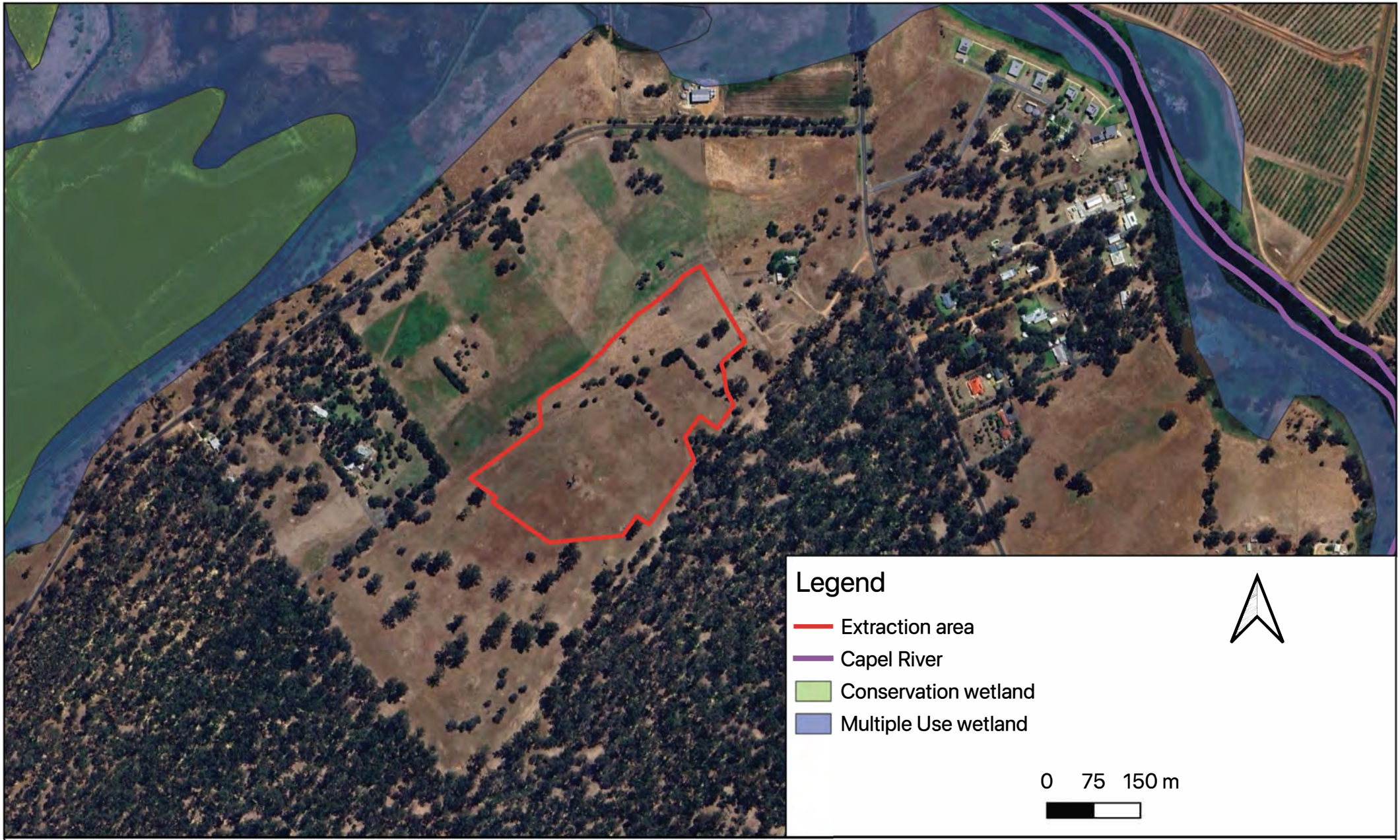
PROJECT 365 Mallokup Road, Stirling Estate

DRAWING TITLE Figure 6- Vegetation to be cleared

CLIENT Dunkley Holdings Pty Ltd

accendo AUSTRALIA
PO Box 5178
West Busselton
Western Australia 6280
Mobile 0418 950 852

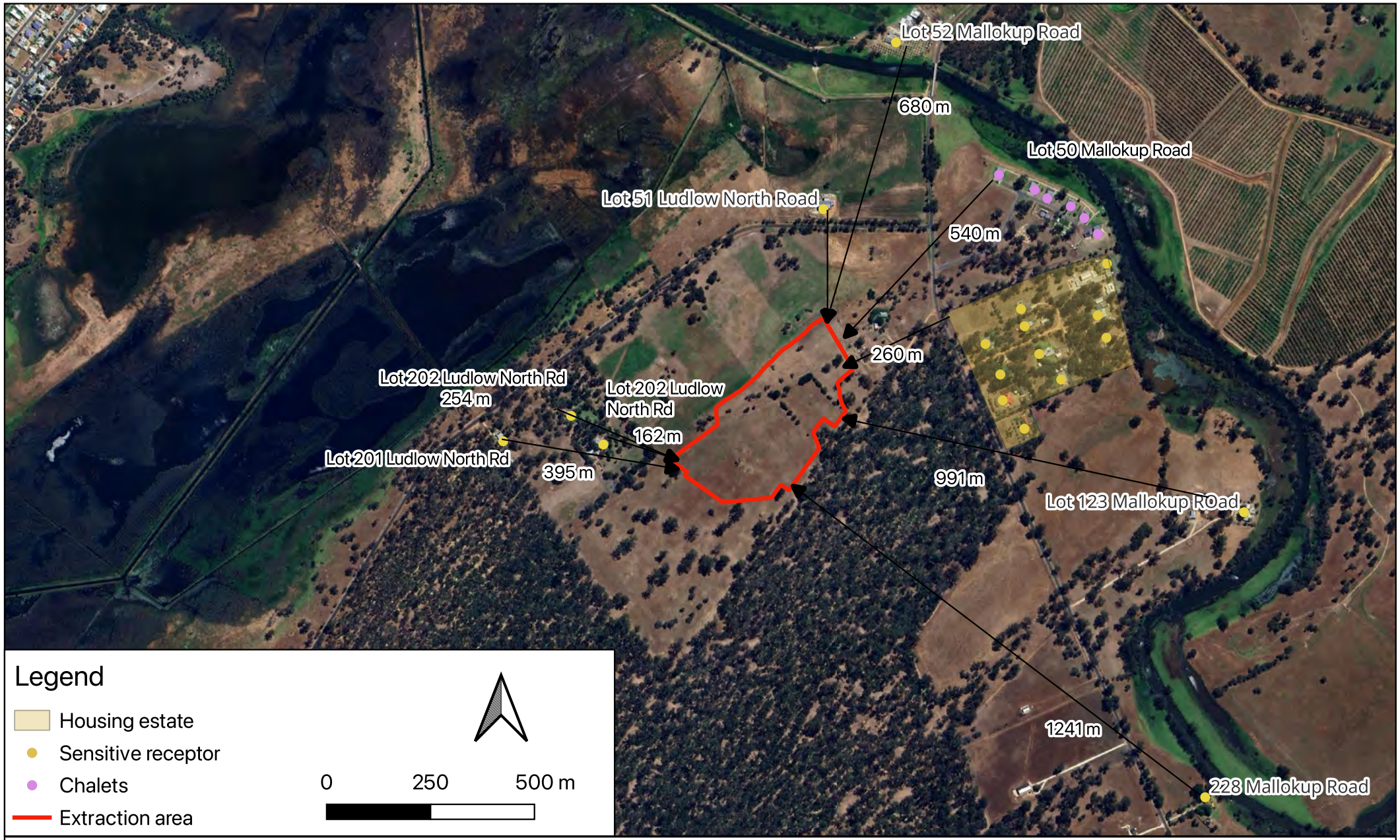
Project Number	2573	Designed	NC
Drawing Number	Figure 6	Drawn	PN
Revision	A	Checked	
Date	01/05/2026	Approved	
Sheet 1 of 1		Local Authority	Shire of Capel



PROJECT	365 Mallokup Road, Stirling Estate
DRAWING TITLE	Figure 7- Surface Water Features
CLIENT	Dunkley Holdings Pty Ltd

accendo AUSTRALIA
PO Box 5178
West Busselton
Western Australia 6280
Mobile 0418 950 852

Project Number	2573	Designed	NC
Drawing Number	Figure 7	Drawn	PN
Revision	A	Checked	
Date	02/04/2026	Approved	
Sheet 1 of 1		Local Authority	Shire of Capel

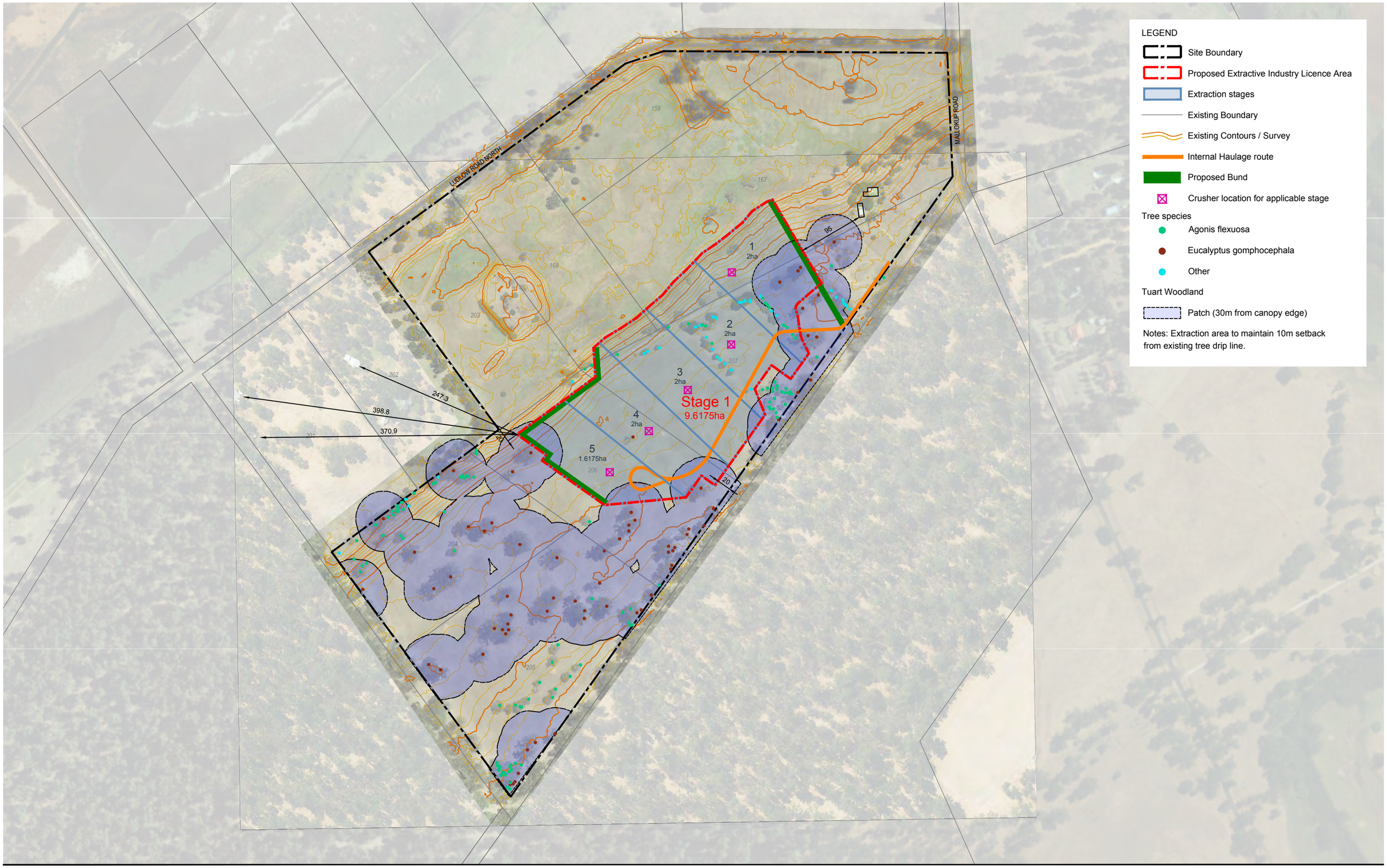


PROJECT	365 Mallokup Road, Stirling Estate
DRAWING TITLE	Figure 8- Sensitive Receptors
CLIENT	Dunkely Holdings Pty Ltd

accendo AUSTRALIA
PO Box 5178
West Busselton
Western Australia 6280
Mobile 0418 950 852

Project Number	2573	Designed	NC
Drawing Number	Figure 8	Drawn	PN
Revision	A	Checked	
Date	18/05/2026	Approved	
Sheet 1 of 1		Local Authority	Shire of Capel

APPENDIX A –EXCAVATION WORKS PLAN



Excavation Works Plan

Mallokup Road, Stirling Estate

0 100m

Date: 26 May 2026 Scale: 1:5000 @ A3 1:10,000 @ A1 File: **23-434 EX01A** Staff: HK JJ Checked: DL

element. | PART OF SLR
Level 1, 500 Hay Street, Subiaco, Western Australia 6008.
T. +61 8 9289 8300 | **E.** hello@elementadvisory.com.au
elementadvisory.com.au

APPENDIX B – GROUNDWATER MONITORING REPORT

24 November 2025

Your Ref:
Our Ref: H23080Bv1

Element
L18 191 St Georges Terrace
Perth WA 6000
ATTENTION: Daniel Lewis

Dear Daniel,

LOTS 159, 168, 167, 203-207 (No. 365) MALLOKUP RD, STIRLING ESTATE
GROUNDWATER MONITORING REPORT

Please find below Hyd2o's report detailing results of the 2024-2025 groundwater monitoring program undertaken across the winters of 2024 and 2025 at Lots 159, 168, 167, and 203–207 (No. 365), Mallokup Rd, Capel (herein referred to as *the site*).

The program involved the installation and monitoring of groundwater levels at five site bores and two external Department of Water and Environmental Regulation (DWER) bores. Monitoring was undertaken over two winter periods (2024 and 2025).

This report has been prepared suitable for agency submission to summarise the data collected and provide groundwater contours across the site for use in establishing a suitable extractive industries floor level.

1. MONITORING DATA AND MGL/AAMGL CALCULATION

Hyd2o managed the installation of bores by Edrill at the site on 5 April 2024. The total of five groundwater monitoring bores were installed using a drill rig and constructed suitable for water level and quality monitoring. All bores were surveyed to Australian Height Datum. Bore logs are presented in Attachment A, with a plan showing the site and location of all relevant groundwater monitoring bores (including DWER bores) provided as Figure 1.

Groundwater level monitoring was undertaken monthly on 10 occasions across both winters. Measurements were collected in April, August, September, October and November 2024, and in May, August, September, October and November 2025.

2. MONITORING RESULTS

Groundwater levels recorded at all sites and DWER bores are included in Attachment B.

Peak groundwater levels during the monitoring period occurred in October 2025 at bore MB5 (1.26 mAHD). Three bores—MB2, MB3 and MB4—recorded their highest levels in September 2025 at 0.70 mAHD, 0.97 mAHD and 1.00 mAHD respectively. Bore MB1 recorded its maximum level in November 2025 at 0.46 mAHD.

Bore MB1 recorded the lowest groundwater level among all monitoring bores during both the 2024 and 2025 monitoring periods, despite being located furthest from the Capel River and the Stirling Wetlands compared to the other site bores. This result across consecutive monitoring years indicates that it is unlikely to be an isolated or anomalous event. Reasons for this are unclear however it is possible this may be due to localised drawdown associated

with groundwater uptake by the extensive Tuart (*Eucalyptus gomphocephala*) forest located along the southern and western boundaries of the site.

The DWER bores groundwater levels have been recorded since 1978 (BY24A) and 1984 (BN1S), with the DWER bores long term historical hydrographs included as Attachment C. The average annual maximum groundwater level (AAMGL) for these DWER bores were calculated across 2000 – 2025 for this assessment, considered more representative of recent levels and climate.

DWER bores BY24A and BN1S had their peak levels during the 2024-2025 monitoring period both in August 2025 with the recorded levels of 2.00 mAHD and 1.55 mAHD respectively being the highest levels of the last 25 years.

Table 1 presents the AAMGL values and shows that peak groundwater levels in winter 2024 and 2025 were above the long-term average.

A correction factor was applied to the site bores based on the difference between DWER bore readings and their calculated AAMGL (2000–2025). The corrected site AAMGL values are presented in Table 2 and contoured in Figure 1.

A depth from natural surface to AAMGL map is contained as Figure 2.

Table 1: DWER Monitoring Bore AAMGL

Bore	Period of Record	Period for AAMGL Calculation	AAMGL (mAHD)	2000-2025 MGL (mAHD)	Max Level 2025 (mAHD)	Difference to AAMGL (m)
BN1S	1984 – 2025	2000 – 2025	0.85	1.55	1.55 (Aug)	-0.70
BY24A	1978 – 2025	2000 – 2025	1.63	2.00	2.00 (Aug)	-0.37
Correction Factor to Apply to Site Bores for AAMGL (m)						-0.54

Table 2: Site AAMGL

Bore	Max Level 2025 (mAHD)	Correction Factor (m)	AAMGL (mAHD)
MB1	0.46 (Nov)	-0.54	-0.08
MB2	0.70 (Sept)		0.16
MB3	0.97 (Sept)		0.43
MB4	1.00 (Sept)		0.46
MB5	1.26 (Oct)		0.72

3. REFERENCES

Department of Water and Environmental Regulation, Water Information Reporting, accessed November 2025.

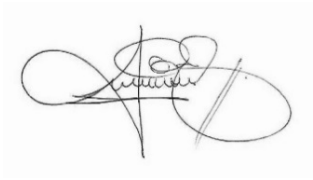
Department of Water and Environmental Regulation, Water Register, accessed November 2025.

Hyd2o (2024), Lots 159, 168, 167, 203-207 (No. 365) Mallokup Rd, Stirling Estate Groundwater Monitoring Report 2024, December 2024

McVicar, T. R., & Roderick, M. L. (2014). The relationship between groundwater and vegetation: A review of the literature. Hydrology and Earth System Sciences, 18(1), 1–12.

Should you have any queries regarding this report, please do not hesitate to contact Andre Righetti or Sasha Martens of this office.

Yours sincerely,



Andre Righetti
Environmental Engineer / Hydrologist

Attachments

Figure 1: Bore Location Plan & AAMGL Mapping
Figure 2: Depth to AAMGL Mapping
Attachment A: Bore Logs
Attachment B: Groundwater Levels Summary
Attachment C: Long Term DWER Hydrographs

FIGURES

Date: 20/11/2025 Job No. H23080

Site Boundary
Site Groundwater Monitoring Bore
DWER Groundwater Monitoring Bore
AAMGL Contour (mAHD)
LiDAR Contour (mAHD)

0 120 240 Meters

Data Source:
Water Information Reporting DWER
LiDAR DEM - DWER
Aerial Image - Landgate

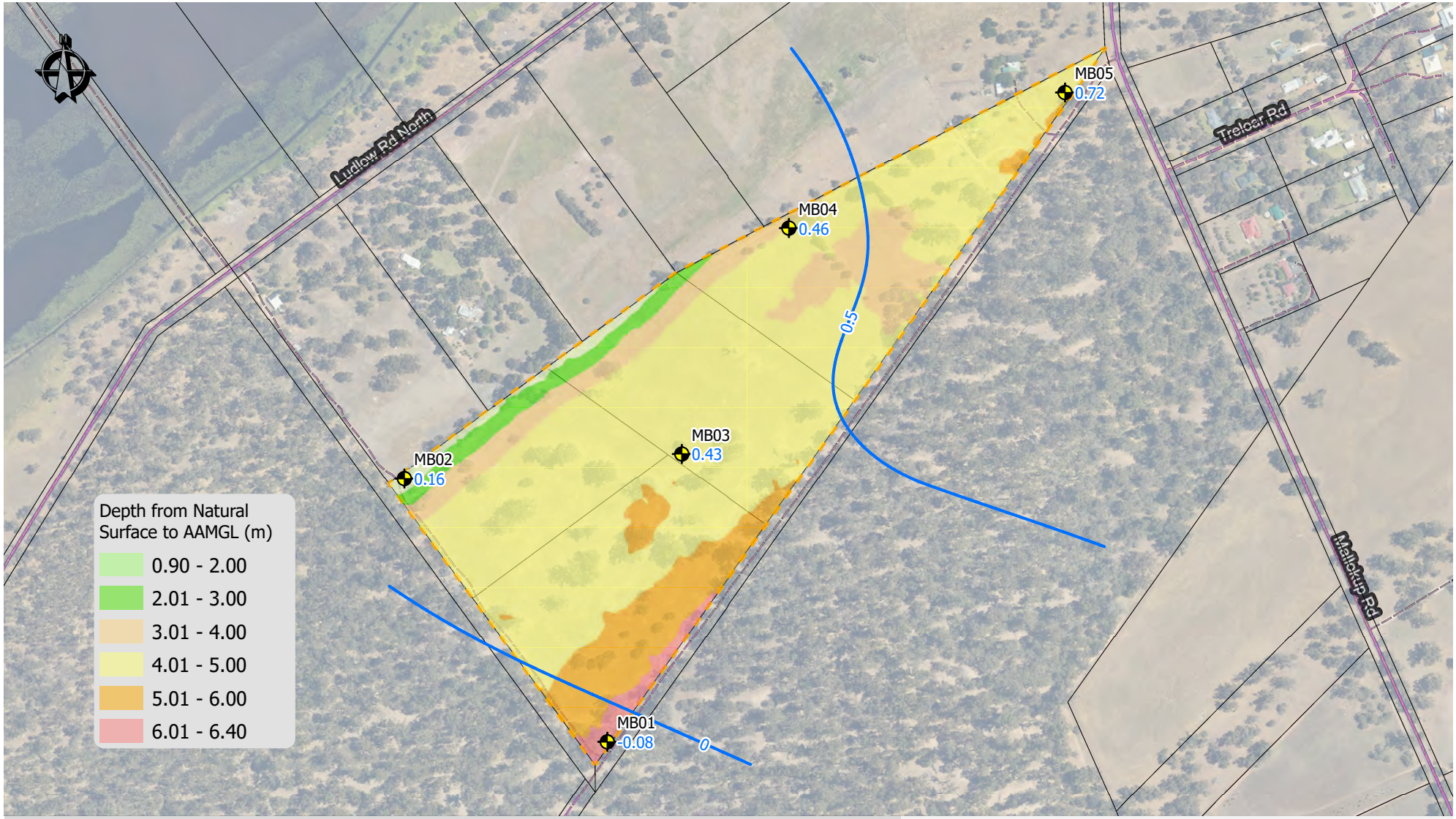
hyd2o

Lots 159, 168, 167, 203-207 (No.365) Mallokup Rd
Stirling Estate Capel Monitoring

AAMGL Mapping

Figure 1

Date: 20/11/2025 Job No. H23080



Site Boundary

Site Groundwater Monitoring Bore

AAMGL Contour (mAHD)

0 90 180 Meters

Data Source:
LiDAR DEM - DWER
Aerial Image - Landgate

hyd2o

Lots 159, 168, 167, 203-207 (No.365) Mallokup Rd
Stirling Estate Capel Monitoring

Depth to AAMGL Mapping

Figure 2

ATTACHMENT 1

Bore Logs via Hyd2o 2024

Lithological Log

Hyd2o
Suite 1 387 Hay St
Subiaco, WA 6008

PO Box 1055
Subiaco WA 6904

Date :	**5/04/2024**				
Client :	**Element**	Job Number :	H24008	Bore Name	
Project:	**Stirling Estate GW Monitoring**	Start Hole :	**8:15**		
Easting	**363542.12**	End Hole :	**9:30**	**MB1**	
Northing	**6288722.452**	Logged by :	**AFR**		
Datum:	GDA94	Total Depth :	**8.0**		
Drill type:	Drill Rig Auger	RL Top of Casing :	**6.765**		
Hole diameter:	2.5 inches	RL Nat Surface :	**6.165**		

support	backfill	water	Slot / Screen Depth	Depth (metres)	Soil Characteristics					
					Colour	Particle Size	Texture	Organic Content	Moisture	Comment
PVC (Class 9)	CEMENT			0.5m	Brown Dark Brown	Fine to Medium	Sand	None	Dry	
	BENTONITE SEAL			1.0m	Brown					
	GRAVEL			1.5m						
				2.0m	Brown Light Brown					
				2.5m	Light Brown					
				3.0m	Brown					
				3.5m	Beige Brown		Sand with minor limestone and shells			
				4.0m						
				4.5m						
				5.0m						

COLOUR : Black, White, Beige
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

MOISTURE : Dry, Slightly Moist, Moist, Saturated

Static Water Level

Date	
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

Lithological Log

Hyd2o
Suite 1 387 Hay St
Subiaco, WA 6008

PO Box 1055
Subiaco WA 6904

Date :	**5/04/2024**				
Client :	**Element**	Job Number :	H24008	Bore Name	
Project:	**Stirling Estate GW Monitoring**	Start Hole :	**8:15**		
Easting	**363542.12**	End Hole :	**9:30**	**MB1**	
Northing	**6288722.452**	Logged by :	**AFR**		
Datum:	GDA94	Total Depth :	**8.0**		
Drill type:	Drill Rig Auger	RL Top of Casing :	**6.765**		
Hole diameter:	2.5 inches	RL Nat Surface :	**6.165**		

support	backfill	water	Slot / Screen Depth	Depth (metres)	Soil Characteristics					
					Colour	Particle Size	Texture	Organic Content	Moisture	Comment
PVC (Class 9)	GRAVEL	▽		5.5m	Light Brown	Fine to Medium	Gravelly Sand (limestone and shell)	None	Dry	
				6.0m					Moist	
				6.5m	Light Brown Beige					
				7.0m	Dark Beige		Sand		Saturated	
				7.5m						
				8.0m						end of hole at 8.0 m
				8.5m						
				9.0m						
				9.5m						
				10.0m						

COLOUR : Black, White, Biege
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

MOISTURE : Dry, Slightly Moist, Moist, Saturated

Static Water Level

Date	8/04/2024
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

Lithological Log

Hyd2o
Suite 1 387 Hay St
Subiaco, WA 6008

PO Box 1055
Subiaco WA 6904

Date :	**5/04/2024**	Job Number :	H24008	Bore Name
Client :	**Element**	Start Hole :	**9:45**	**MB2**
Project:	**Stirling Estate GW Monitoring**	End Hole :	**11:00**	
Easting	**363288.109**	Logged by :	**AFR**	
Northing	**6289051.86**	Total Depth :	**5.0**	
Datum:	GDA94	RL Top of Casing :	**2.024**	
Drill type:	Drill Rig Auger	RL Nat Surface :	**1.424**	
Hole diameter:	2.5 inches			

support	backfill	water	Slot / Screen Depth	Depth (metres)	Soil Characteristics: Colour	Particle Size	Texture	Organic Content	Moisture	Comment
PVC (Class 9)	CEMENT			0.5m	Dark Grey Black	Fine to Medium	Sand	Medium	Dry	
	BENTONITE SEAL			1.0m	Dark Grey		Clayey Sand	Low		
	GRAVEL	▽		1.5m	Dark Grey Light Brown			None	Slightly Moist	
				2.0m	Dark Grey Brown				Moist	
				2.5m	Brown					
				3.0m						
				3.5m	Dark Brown		Sandy Clay		Saturated	
				4.0m	Light Brown		Clayey Sand			
				4.5m						
				5.0m						end of hole at 5.0 m

COLOUR : Black, White, Beige
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

MOISTURE : Dry, Slightly Moist, Moist, Saturated

Static Water Level

Date	
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

Lithological Log

Hyd2o
Suite 1 387 Hay St
Subiaco, WA 6008

PO Box 1055
Subiaco WA 6904

Date :	**5/04/2024**				
Client :	**Element**	Job Number :	H24008	Bore Name	
Project:	**Stirling Estate GW Monitoring**	Start Hole :	**6:30**		
Easting	**363635.369**	End Hole :	**8:00**	**MB3**	
Northing	**6289082.42**	Logged by :	**AFR**		
Datum:	GDA94	Total Depth :	**8.0**		
Drill type:	Drill Rig Auger	RL Top of Casing :	**5.625**		
Hole diameter:	2.5 inches	RL Nat Surface :	**5.025**		

support	backfill	water	Slot / Screen Depth	Depth (metres)	Soil Characteristics					
					Colour	Particle Size	Texture	Organic Content	Moisture	Comment
PVC (Class 9)	CEMENT			0.5m	Grey Light Brown	Fine to Medium	Sand	Low	Dry	
	BENTONITE SEAL			1.0m	Brown			None		
	GRAVEL			1.5m	Light Brown					
				2.0m	Beige Light Brown					
				2.5m	Beige					
				3.0m						
				3.5m						
				4.0m			Gravelly Sand (limestone and shell)			
				4.5m	Beige Light Brown					
				5.0m						

COLOUR : Black, White, Beige
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

MOISTURE : Dry, Slightly Moist, Moist, Saturated

Static Water Level

Date	
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

Lithological Log

Hyd2o
Suite 1 387 Hay St
Subiaco, WA 6008

PO Box 1055
Subiaco WA 6904

Date :	**5/04/2024**				
Client :	**Element**	Job Number :	H24008	Bore Name	
Project:	**Stirling Estate GW Monitoring**	Start Hole :	**6:30**		
Easting	**363635.369**	End Hole :	**8:00**	**MB3**	
Northing	**6289082.42**	Logged by :	**AFR**		
Datum:	GDA94	Total Depth :	**8.0**		
Drill type:	Drill Rig Auger	RL Top of Casing :	**5.625**		
Hole diameter:	2.5 inches	RL Nat Surface :	**5.025**		

support	backfill	water	Slot / Screen Depth	Depth (metres)	Soil Characteristics					
					Colour	Particle Size	Texture	Organic Content	Moisture	Comment
PVC (Class 9)	GRAVEL	▽		5.5m	Beige Yellow	Fine to Medium	Gravelly Sand (limestone and shell)	None	Slightly Moist	
				6.0m					Moist	
				6.5m	Dark Beige		Sand		Saturated	
				7.0m						
				7.5m						
				8.0m	Beige Brown	Fine	Clayey Sand			end of hole at 8.0m
				8.5m						
				9.0m						
				9.5m						
				10.0m						

COLOUR : Black, White, Biege
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

MOISTURE : Dry, Slightly Moist, Moist, Saturated

Static Water Level

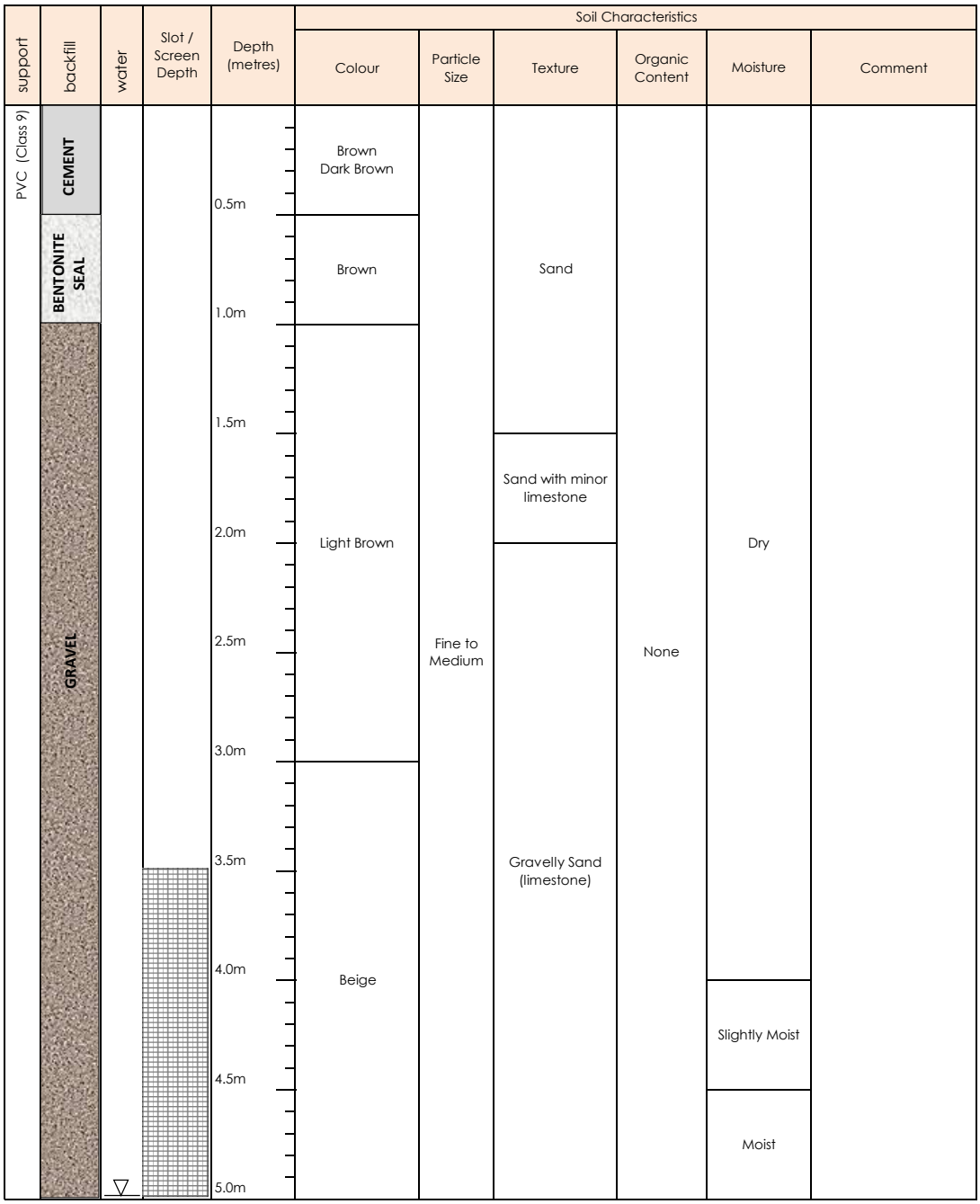
Date	8/04/2024
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

Lithological Log

Hyd2o
Suite 1 387 Hay St
Subiaco, WA 6008

PO Box 1055
Subiaco WA 6904

Date :	**4/04/2024**	Job Number :	H24008	Bore Name
Client :	**Element**	Start Hole :	**16:30**	
Project:	**Stirling Estate GW Monitoring**	End Hole :	**18:00**	**MB4**
Easting	**363769.406**	Logged by :	**AFR**	
Northing	**6289365.099**	Total Depth :	**6.5**	
Datum:	GDA94	RL Top of Casing :	**5.074**	
Drill type:	Drill Rig Auger	RL Nat Surface :	**4.474**	
Hole diameter:	2.5 inches			



COLOUR : Black, White, Beige
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

MOISTURE : Dry, Slightly Moist, Moist, Saturated

Static Water Level

Date	
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

Lithological Log

Hyd2o
Suite 1 387 Hay St
Subiaco, WA 6008

PO Box 1055
Subiaco WA 6904

Date :	**4/04/2024**		Job Number :	H24008	Bore Name
Client :	**Element**		Start Hole :	**16:30**	**MB4**
Project:	**Stirling Estate GW Monitoring**		End Hole :	**18:00**	
Easting	**363769.406**		Logged by :	**AFR**	
Northing	**6289365.099**		Total Depth :	**6.5**	
Datum:	GDA94		RL Top of Casing :	**5.074**	
Drill type:	Drill Rig Auger		RL Nat Surface :	**4.474**	
Hole diameter:	2.5 inches				

support	backfill	water	Slot / Screen Depth	Depth (metres)	Soil Characteristics					
					Colour	Particle Size	Texture	Organic Content	Moisture	Comment
PVC (Class 9)	GRAVEL			5.5m	Light Beige Grey	Fine to Medium	Gravelly Sand (limestone)	None	Saturated	
				6.0m			Clayey Sand			
					Grey					
				6.5m	Grey Brown	Fine	Clay			end of hole at 6.5m
				7.0m						
				7.5m						
				8.0m						
				8.5m						
				9.0m						
				9.5m						
				10.0m						

COLOUR : Black, White, Biege
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

MOISTURE : Dry, Slightly Moist, Moist, Saturated

Static Water Level

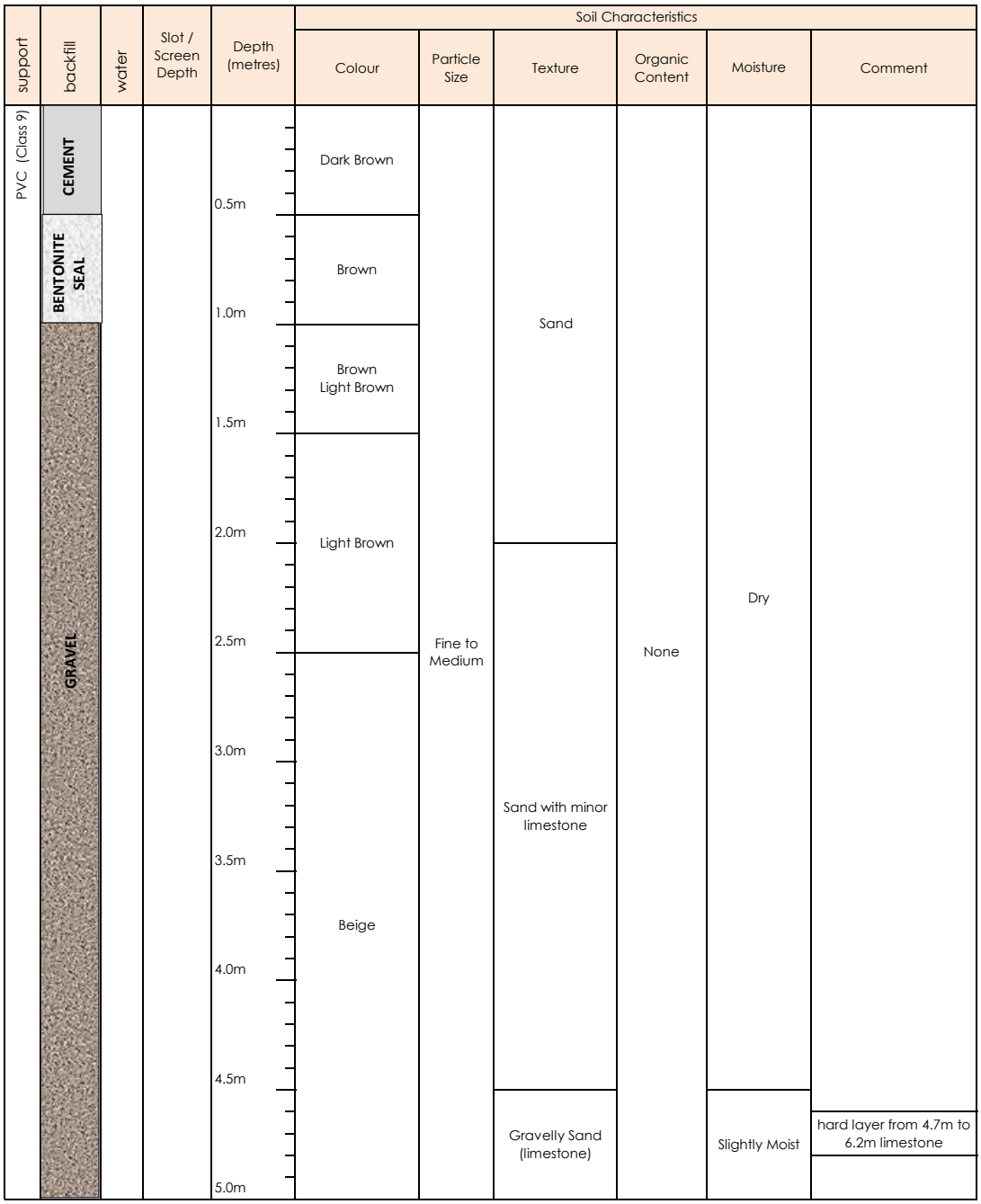
Date	
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

Lithological Log

Hyd2o
Suite 1 387 Hay St
Subiaco, WA 6008

PO Box 1055
Subiaco WA 6904

				Bore Name
Date :	**5/04/2024**	Job Number :	H24008	**MB5**
Client :	**Element**	Start Hole :	**11:15**	
Project:	**Stirling Estate GW Monitoring**	End Hole :	**13:30**	
Easting	**364115.012**	Logged by :	**AFR**	
Northing	**6289534.928**	Total Depth :	**8.0**	
Datum:	GDA94	RL Top of Casing :	**6.081**	
Drill type:	Drill Rig Auger	RL Nat Surface :	**5.481**	
Hole diameter:	2.5 inches			



COLOUR : Black, White, Beige
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

MOISTURE : Dry, Slightly Moist, Moist, Saturated

Static Water Level

Date	
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

Lithological Log

Hyd2o
Suite 1 387 Hay St
Subiaco, WA 6008

PO Box 1055
Subiaco WA 6904

				Bore Name
Date :	**5/04/2024**	Job Number :	H24008	**MB5**
Client :	**Element**	Start Hole :	**11:15**	
Project:	**Stirling Estate GW Monitoring**	End Hole :	**13:30**	
Easting	**364115.012**	Logged by :	**AFR**	
Northing	**6289534.928**	Total Depth :	**8.0**	
Datum:	GDA94	RL Top of Casing :	**6.081**	
Drill type:	Drill Rig Auger	RL Nat Surface :	**5.481**	
Hole diameter:	2.5 inches			

support	backfill	water	Slot / Screen Depth	Depth (metres)	Soil Characteristics: Colour	Particle Size	Texture	Organic Content	Moisture	Comment
PVC (Class 9)	GRAVEL	▽		5.5m	Beige	Fine to Medium	Gravelly Sand (limestone)	None	Slightly Moist	
				6.0m					Moist	
				6.5m						
				7.0m	Dark Beige		Clayey Sand		Saturated	
				7.5m						
				8.0m						end of hole at 8.0 m
				8.5m						
				9.0m						
				9.5m						
				10.0m						

COLOUR : Black, White, Biege
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

MOISTURE : Dry, Slightly Moist, Moist, Saturated

Static Water Level

Date	
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

ATTACHMENT 2

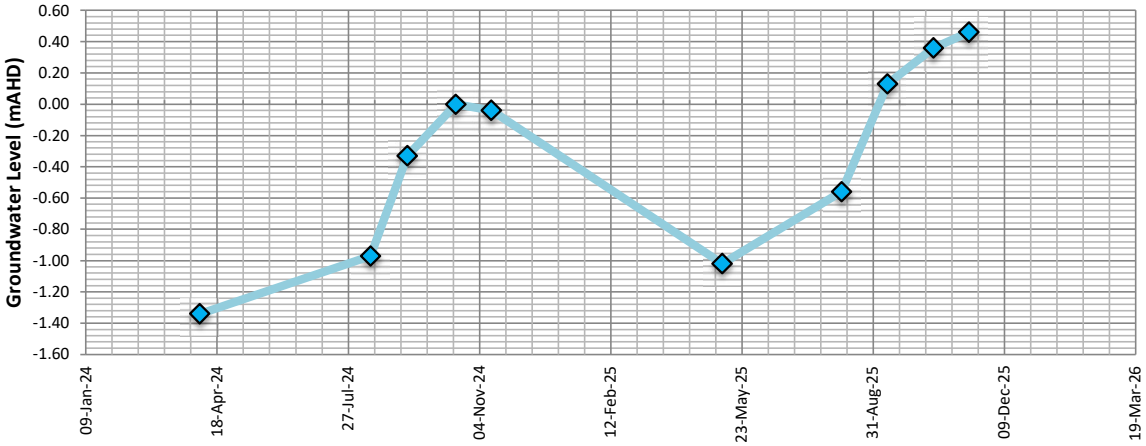
Groundwater Levels Summary

H23080 Stirling Estate Groundater Monitoring

MB1 Site Bore MB1

				Natural Surface (mAHD)	6.17
Data Analysis Period Start Date	1/01/2024	Easting	363542.12	Top of Casing (m AHD)	6.77
Data Analysis Period End Date	31/12/2025	Northing	6288722.452	End of Hole (mAHD)	

Report Date : 18/11/2025



Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
5/04/2024	8.10	-1.34	7.51
13/08/2024	7.73	-0.97	7.14
10/09/2024	7.09	-0.33	6.50
17/10/2024	6.77	0.00	6.17
13/11/2024	6.81	-0.04	6.21
8/05/2025	7.78	-1.02	7.19
7/08/2025	7.32	-0.56	6.73
11/09/2025	6.64	0.13	6.04
16/10/2025	6.40	0.36	5.81
12/11/2025	6.31	0.46	5.71

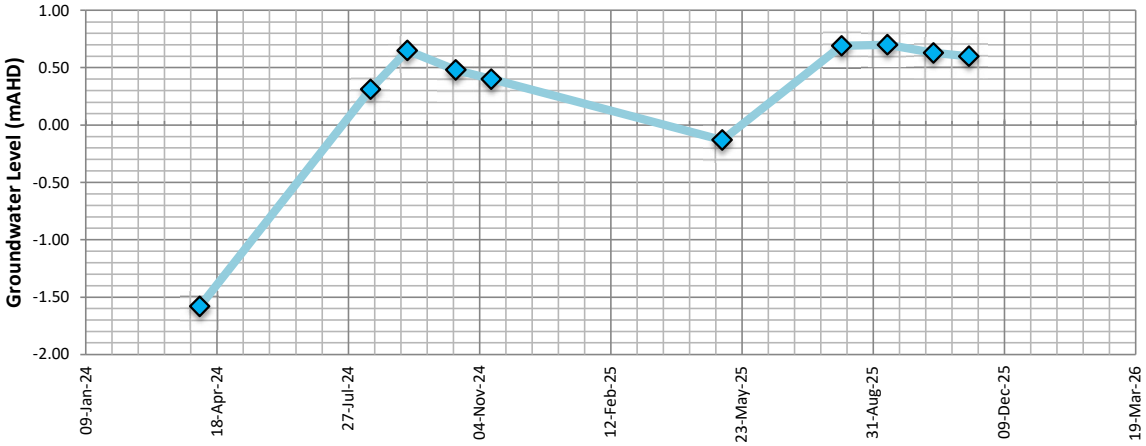
Minimum Recorded Level (mAHD)	-1.34
Maximum Recorded Level (mAHD)	0.46

H23080 Stirling Estate Groundater Monitoring

MB2 Site Bore MB2

Data Analysis Period Start Date	1/01/2024	Easting	363288.109	Natural Surface (mAHD)	1.42
Data Analysis Period End Date	31/12/2025	Northing	6289051.86	Top of Casing (m AHD)	2.02
				End of Hole (mAHD)	

Report Date : 18/11/2025



Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
5/04/2024	3.60	-1.58	3.00
13/08/2024	1.71	0.31	1.11
10/09/2024	1.37	0.65	0.77
17/10/2024	1.54	0.48	0.94
13/11/2024	1.62	0.40	1.02
8/05/2025	2.15	-0.13	1.55
7/08/2025	1.33	0.69	0.73
11/09/2025	1.32	0.70	0.72
16/10/2025	1.39	0.63	0.79
12/11/2025	1.42	0.60	0.82

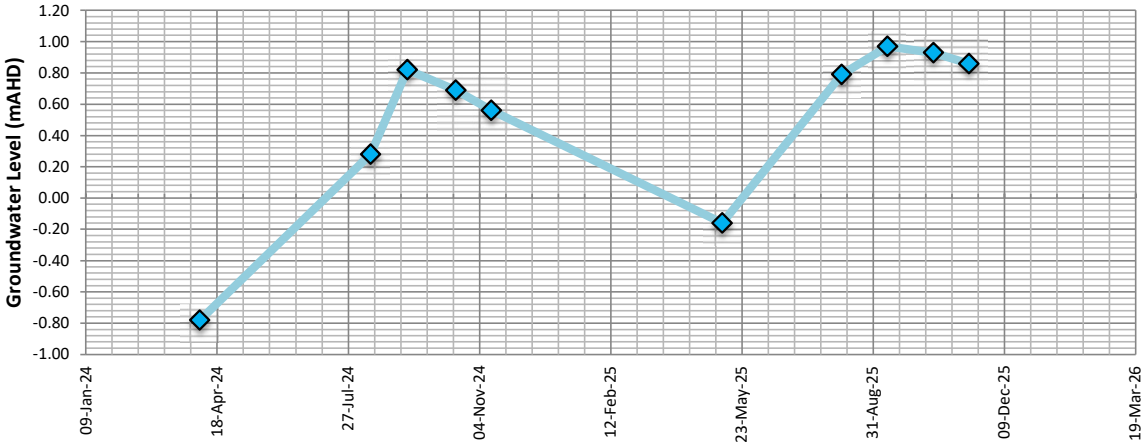
Minimum Recorded Level (mAHD)	-1.58
Maximum Recorded Level (mAHD)	0.70

H23080 Stirling Estate Groundater Monitoring

MB3 Site Bore MB3

Data Analysis Period Start Date	1/01/2024	Easting	363635.369	Natural Surface (mAHD)	5.03
Data Analysis Period End Date	31/12/2025	Northing	6289082.42	Top of Casing (m AHD)	5.63
				End of Hole (mAHD)	

Report Date : 18/11/2025



Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
5/04/2024	6.40	-0.78	5.81
13/08/2024	5.35	0.28	4.75
10/09/2024	4.81	0.82	4.21
17/10/2024	4.94	0.69	4.34
13/11/2024	5.07	0.56	4.47
8/05/2025	5.78	-0.16	5.19
7/08/2025	4.84	0.79	4.24
11/09/2025	4.66	0.97	4.06
16/10/2025	4.70	0.93	4.10
12/11/2025	4.77	0.86	4.17

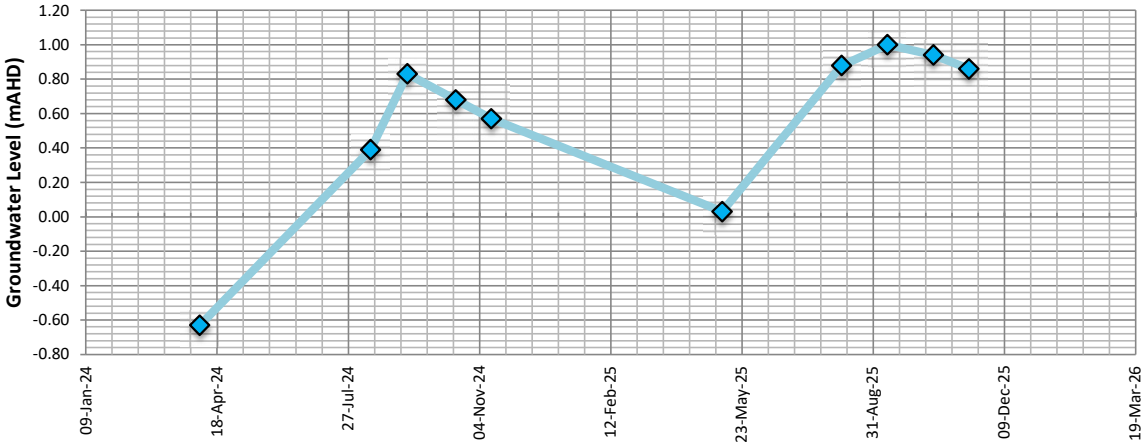
Minimum Recorded Level (mAHD)	-0.78
Maximum Recorded Level (mAHD)	0.97

H23080 Stirling Estate Groundater Monitoring

MB4 Site Bore MB4

				Natural Surface (mAHD)	4.47
Data Analysis Period Start Date	1/01/2024	Easting	363769.406	Top of Casing (m AHD)	5.07
Data Analysis Period End Date	31/12/2025	Northing	6289365.099	End of Hole (mAHD)	

Report Date : 18/11/2025



Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
5/04/2024	5.70	-0.63	5.10
13/08/2024	4.68	0.39	4.08
10/09/2024	4.24	0.83	3.64
17/10/2024	4.39	0.68	3.79
13/11/2024	4.50	0.57	3.90
8/05/2025	5.04	0.03	4.44
7/08/2025	4.19	0.88	3.59
11/09/2025	4.07	1.00	3.47
16/10/2025	4.13	0.94	3.53
12/11/2025	4.21	0.86	3.61

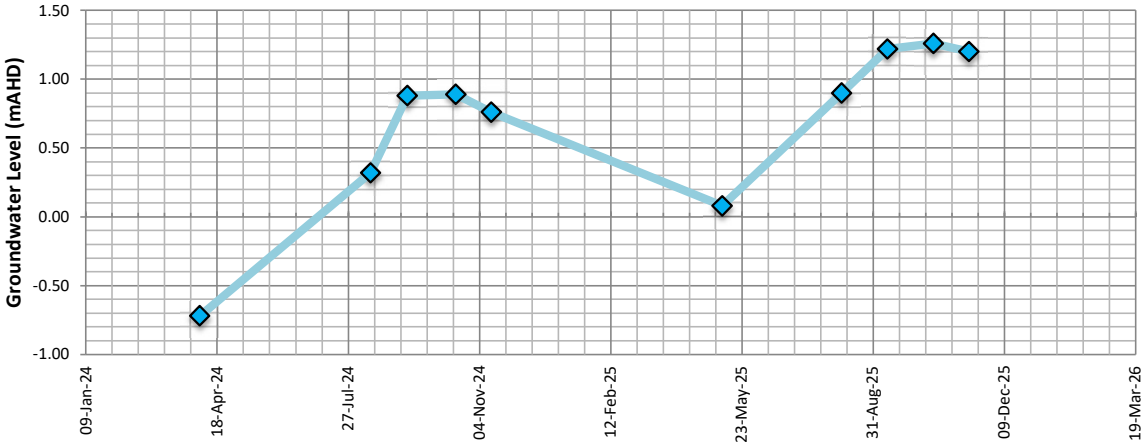
Minimum Recorded Level (mAHD)	-0.63
Maximum Recorded Level (mAHD)	1.00

H23080 Stirling Estate Groundater Monitoring

MB5 Site Bore MB5

Data Analysis Period Start Date	1/01/2024	Easting	364115.012	Natural Surface (mAHD)	5.48
Data Analysis Period End Date	31/12/2025	Northing	6289534.928	Top of Casing (m AHD)	6.08
				End of Hole (mAHD)	

Report Date : 18/11/2025



Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
5/04/2024	6.80	-0.72	6.20
13/08/2024	5.76	0.32	5.16
10/09/2024	5.20	0.88	4.60
17/10/2024	5.19	0.89	4.59
13/11/2024	5.32	0.76	4.72
8/05/2025	6.00	0.08	5.40
7/08/2025	5.18	0.90	4.58
11/09/2025	4.86	1.22	4.26
16/10/2025	4.82	1.26	4.22
12/11/2025	4.88	1.20	4.28

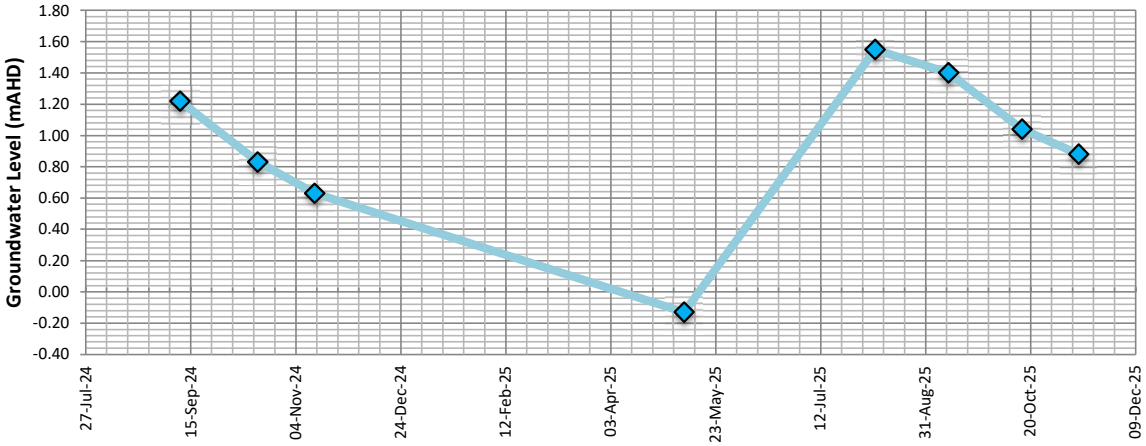
Minimum Recorded Level (mAHD)	-0.72
Maximum Recorded Level (mAHD)	1.26

H23080 Stirling Estate Groundater Monitoring

BN1S DWER Bore BN1S

				Natural Surface (mAHD)	
Data Analysis Period Start Date	1/01/2024	Easting	364379.54	Top of Casing (m AHD)	3.08
Data Analysis Period End Date	31/12/2025	Northing	6290391.45	End of Hole (mAHD)	

Report Date : 18/11/2025



Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
10/09/2024	1.86	1.22	
17/10/2024	2.25	0.83	
13/11/2024	2.45	0.63	
8/05/2025	3.21	-0.13	
7/08/2025	1.53	1.55	
11/09/2025	1.68	1.40	
16/10/2025	2.04	1.04	
12/11/2025	2.20	0.88	

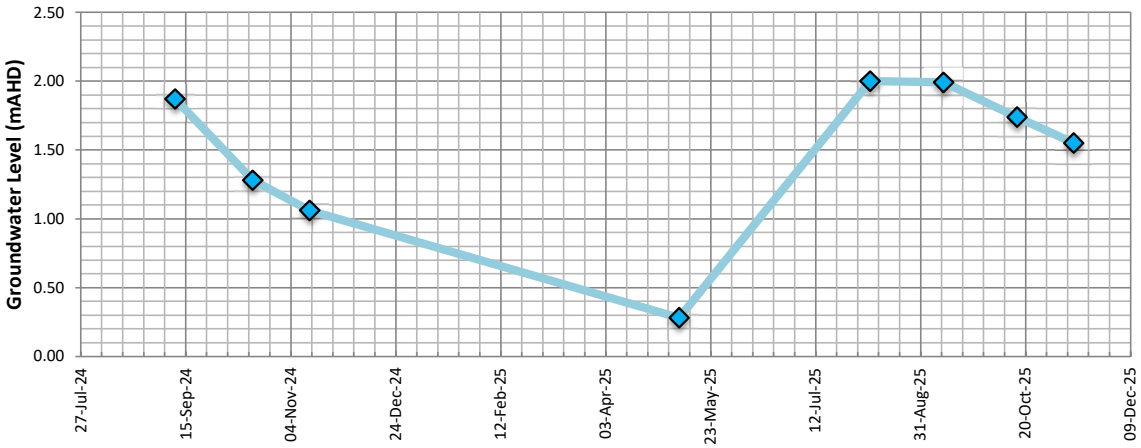
Minimum Recorded Level (mAHD)	-0.13
Maximum Recorded Level (mAHD)	1.55

H23080 Stirling Estate Groundater Monitoring

BY24A DWER Bore BY24A

Data Analysis Period Start Date	1/01/2024	Easting	366214.02	Natural Surface (mAHD)	
Data Analysis Period End Date	31/12/2025	Northing	6292938.49	Top of Casing (m AHD)	2.60
				End of Hole (mAHD)	

Report Date : 18/11/2025



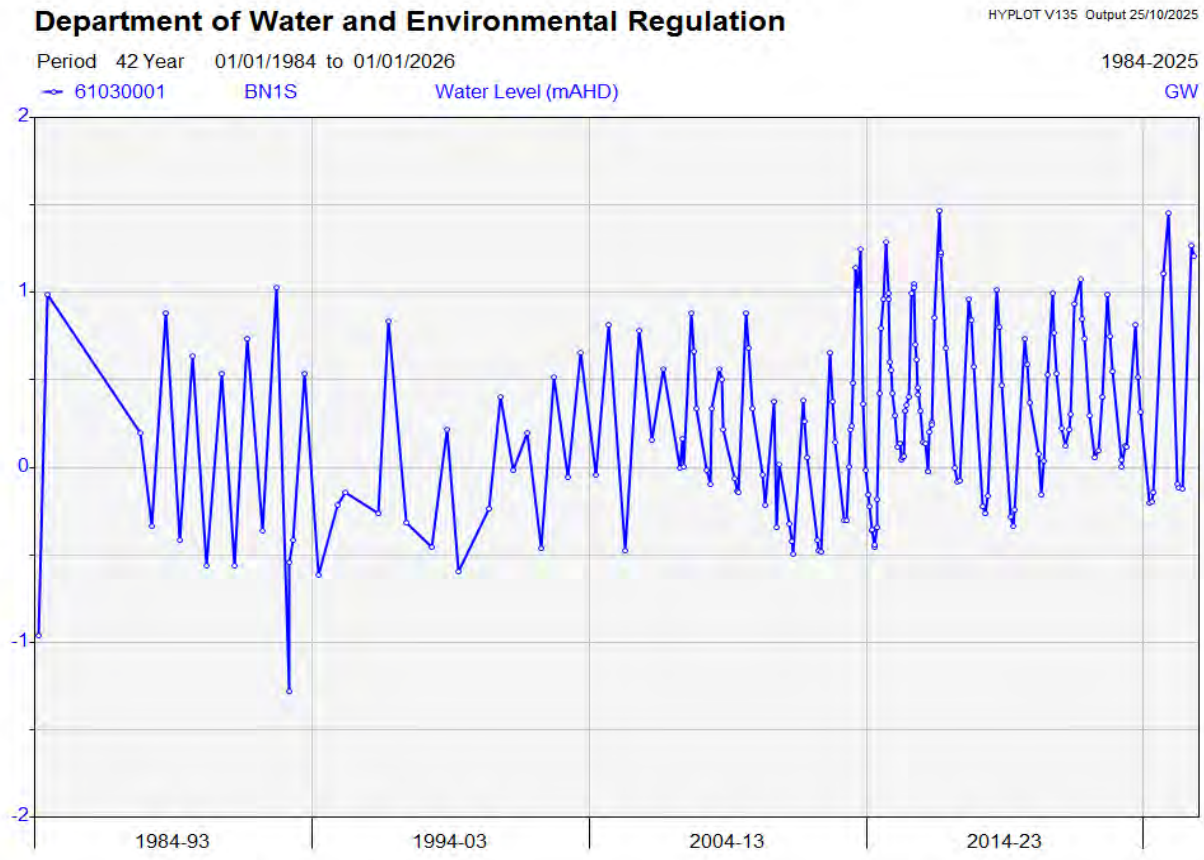
Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
10/09/2024	0.73	1.87	
17/10/2024	1.32	1.28	
13/11/2024	1.54	1.06	
8/05/2025	2.32	0.28	
7/08/2025	0.60	2.00	
11/09/2025	0.61	1.99	
16/10/2025	0.86	1.74	
12/11/2025	1.05	1.55	

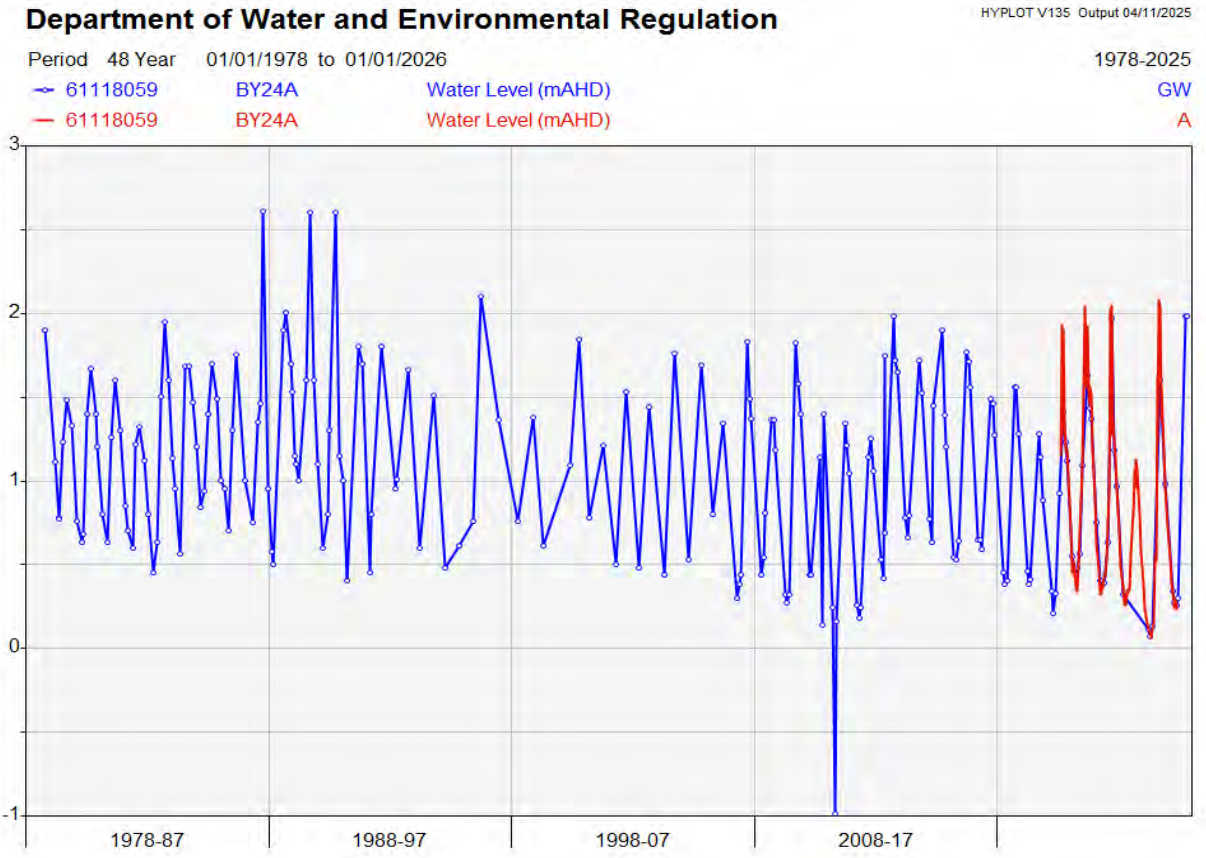
Minimum Recorded Level (mAHD)	0.28
Maximum Recorded Level (mAHD)	2.00

ATTACHMENT 3

DWER Long Term Hydrographs

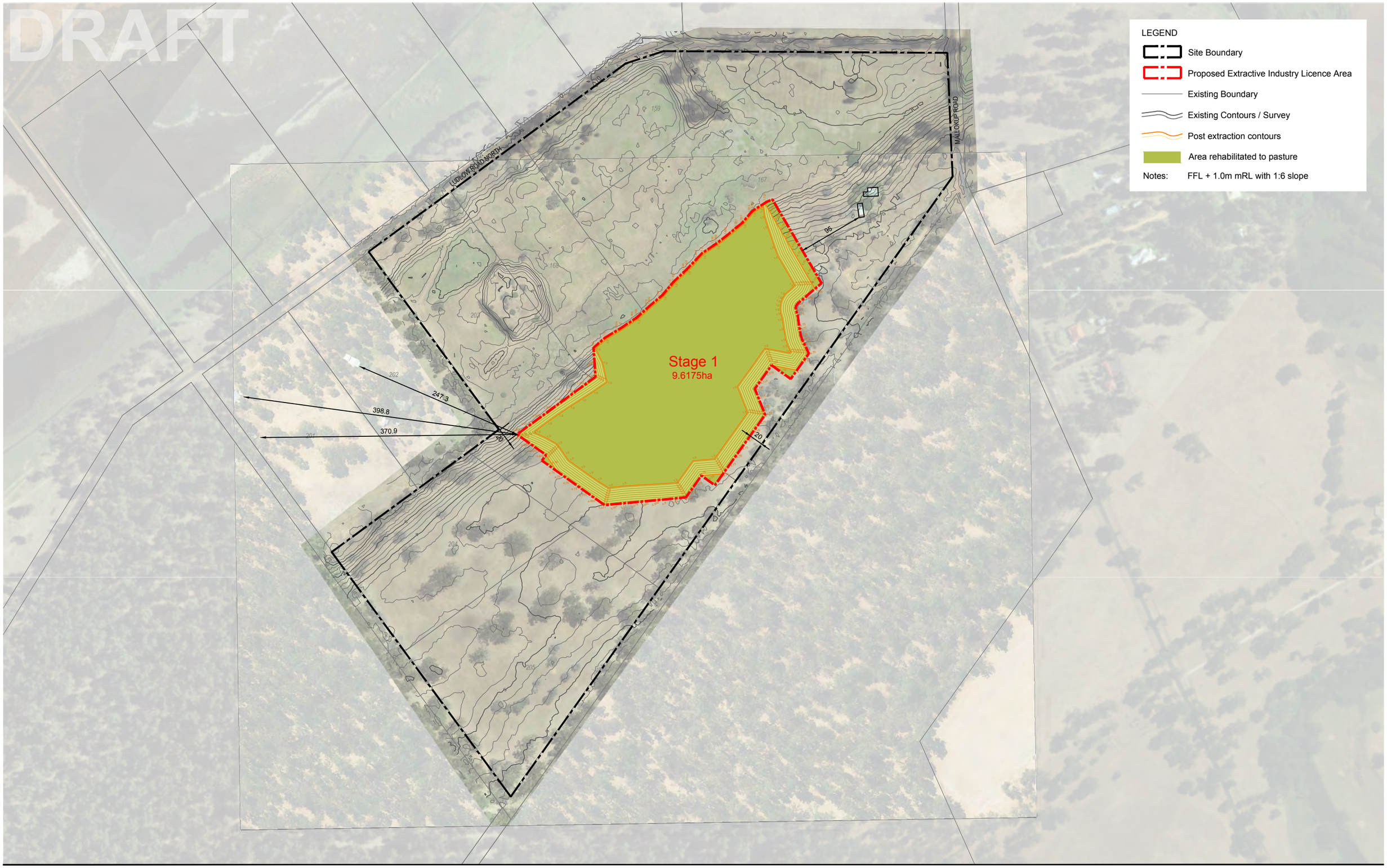
Date : 19/11/2025 Job No H23080





APPENDIX C – POST EXTRACTION PLAN

DRAFT



Rehabilitation Plan

Mallokup Road, Stirling Estate

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APPENDIX D – WATER MANAGEMENT PLAN

WATER MANAGEMENT PLAN

LOTS 167 (No.365), 204, 205, 206 & 207 (No.363) MALLOKUP ROAD AND LOTS 159, 168 & 203LUDLOW ROAD NORTH, STIRLING ESTATE

MAY 2026

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Document Control

Version	Date	Author	Reviewer
V1	04/05/2026	NC	KMT
V2	14/05/2026	NC	KMT
V3	18/05/2026	NC	KMT
Filename	2573_365 Mallokup Rd WMP_V3		

Limitations

This report has been prepared by Accendo Australia Pty Ltd in accordance with the scope limitations provided in this report, or as otherwise agreed, between the Client and Accendo.

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.

This report has been prepared based upon data and other information provided by the Client and other individuals and organisations, most of which are referred to in the report, which Accendo has not independently verified or checked beyond the agreed scope of work. Accendo does not accept liability in connection with such unverified information.

The conclusions and recommendations in this report are based on assumptions made by Accendo described in this report where and as they are required. Accendo disclaims liability arising from any of the assumptions being incorrect.

The report is based on site specific conditions encountered and information received at the time of preparation of this report or the time that site investigations were undertaken. Accendo disclaims responsibility for any changes that may have occurred after this time.

The preparation of this report has been undertaken and performed in a professional manner, in consideration of the scope of services and in accordance with environmental consulting practices. No other warranty is made.

CONTENTS

TABLES

FIGURES

1 INTRODUCTION

1.1 Background

Dunkley Holdings Pty Ltd (the applicant) is proposing to extract sand and limestone from a 9.62 hectare (ha) area within Lots 167 (No. 365), 204, 205, 206 and 207 (No. 363) Mallokup Road and 159, 168 and 203 Ludlow Road North, Stirling Estate (herein referred to as the subject site) (refer to **Figure 1** and **2**).

This application is made for a five year period however, the exact life of the project is difficult to estimate as it will be dependent on supply and demand trends.

The final contours of the pit floor will be approximately 1 metre (m) Australian Height Datum (AHD).

Slopes of the batters at the end of excavation will be retained at 1:6 vertical to horizontal.

1.2 Purpose and Scope

The purpose of this Water Management Plan (WMP) is to review the risks and control measures to appropriately manage minimise the environmental impacts of the extractive industry on both groundwater and surface water in proximity to the subject site.

The scope of the WMP is to cover the following:

- Legislative and regulatory compliance;
- Existing environment;
- Risk assessment water quality impacts;
- Mitigation and measurement measures; and
- Roles and responsibilities in relation to water management.

2 EXISTING ENVIRONMENT

2.1 Location

The subject site is located within Lots 167(No. 365), 204, 205, 206 and 207(No. 363) Mallokup Road and 159, 168 and 203 Ludlow Road North, Stirling Estate. All lots apart from Lot 203 Ludlow Road North, Stirling Estate are owned by Dunkley Holdings Pty Ltd. Lot 203 Ludlow Road North, Stirling Estate is owned by Alison Thelma Dunkley.

The subject site is located within the municipality of the Shire of Capel, approximately 3.8 kilometres (km) northwest of the Capel town centre and approximately 190 km south of Perth (refer to **Figure 1** and **Figure 2**).

2.2 Land Use

The subject site is zoned 'Priority Agriculture' pursuant to the Shire's *LPS No.* 8 and 'Rural' under the *GBRS*. The subject site has previously been used for agriculture.

Properties to the north and west are zoned 'Priority Agriculture' under *LPS No. 8* and 'Rural' under the *GBRS*. Beyond the properties to the west lies the Tuart Forest National Park, which also adjoins the subject site to the south and east and is zoned 'Public Open Space' under the *LPS No. 8* and 'Regional Open Space' and 'Rural' under the *GBRS*. Properties to the east are also zoned 'Priority Agriculture' under the *LPS No. 8*, and 'Regional Open Space' and 'Rural' under the *GBRS*.

Furthermore, pursuant to the *LPS No.8*, the subject site is also mapped as being located within the 'Special Control Area – Regional Ecological Linkages – SCA8 (Capel)'.

Historically the subject site has been used for livestock grazing, resulting in the disturbance of native vegetation onsite. The subject site is comprised of pasture areas that have been 'parkland cleared' apart from paddock trees consisting of planted *Eucalyptus gomphocephala* (Tuart) and *Agonis flexuosa* (Peppermint).

2.3 Topography and Soils

The current topography of the subject site can be described as sloping with the elevation ranging from 1.5 m AHD in the north to 5 m AHD in the southwest (refer to **Appendix A**).

The subject site is located within the Perth Coastal Zone within the Spearwood and Vasse Systems consisting of '*sand dunes and plains, yellow deep sands, pale deep sands and yellow/brown shallow sands*' and '*poorly drained estuarine flats, of the Swan Coastal Plain. Tidal flat soil, saline wet soil and pale deep sand*,' respectively (Natural Resource Information (NRInfo).

The subject site is located within the following sub-systems (refer to **Figure 3**):

- Vasse Wonnerup wet flats phase- Poorly drained flats around the edge of the Vasse Estuary. Dark calcareous sands and mixed estuarine deposits; and
- Ludlow flats phase- Flats and very low dunes. Deep yellow brown siliceous sands over limestone (i.e. Spearwood Sands).

2.4 Climate

The climate of the locality is classified as Mediterranean with warm to hot dry summers and cool wet winters.

The closest weather recording station is Bunbury (Station 9965). Temperatures are highest on average in February, at approximately 30.2°C. July has the lowest average temperature of the year of 7.4°C.

Rainfall at the closest weather recording station Capel North (Station 9992), is approximately 673 mm per annum with approximately 90% of the rain falling during the winter months, April to October inclusive.

During the summer months the dominant wind in the mornings is from the south-east at 17-18 knots, swinging to the south-west at approximately 22 knots in the afternoon. During winter, the winds are most commonly 12-19 knots from no dominant prevailing direction. During storms, winds from the west and north-west can reach 40 knots (BoM 2020).

Rainfall intensity has been calculated using the Bureau of Meteorology (BoM) Intensity-Frequency-Duration (IFD) data system which yields the two hour 1 in 10 (10%) annual exceedance probability storm event for the subject site as 41.3 mm/hr.

2.5 Hydrology

2.5.1 Groundwater

The subject site is located within the Busselton-Capel subarea of the *Rights in Water and Irrigation Act 1914* (RiWI Act) proclaimed Busselton-Capel Groundwater Area.

A groundwater monitoring programme was undertaken across the site during the winters of 2024 and 2025 (Hyd2o 2025), whereby five onsite monitoring bores and two external DWER bores were monitored over ten monitoring events (refer to **Appendix B**). Data from this monitoring showing that peak groundwater levels in winter 2024 and 2025 were above the long-term average, was used to produce average annual maximum groundwater levels (AAMGL) in m AHD for the site, taking into consideration annual variation over the last 25 years in the DWER bores. Contours produced from these values indicate an AAMGL of approximately 0.5 m AHD across the subject site.

Given the proposed maximum excavation level of 1 m AHD, at least 0.5 m separation to groundwater will be maintained at all times.

2.5.2 Surface Water

The subject site is located in the Capel River West Subarea of the RiWI Act proclaimed Capel River System Surface Water Area.

The subject site does not contain any surface water features. The closest surface water feature is the Capel River located approximately 580 m to the north of the subject site (refer to **Figure 3**).

2.5.3 Wetlands

Wetlands within Western Australia are classified on the basis of landform and water permanence pursuant to the Semeniuk (1995) classification system (refer to **Table 1**).

Table 1. Wetland classifications (Semeniuk 1995).

Water Longevity	Landform				
	Basin	Channel	Flat	Slope	Highland
Permanent Inundation	Lake	River	-	-	-
Seasonal Inundation	Sumpland	Creek	Floodplain	-	-
Intermittent Inundation	Playa	Wadi	Barlkarra	-	-

Seasonal Waterlogging	Dampland	Trough	Palusplain	Paluslope	Palusmont

Areas of wetlands in Western Australia have been mapped and this mapping has been converted into a digital dataset that is maintained by the Department of Biodiversity, Conservation and Attractions (DBCA) and is referred to as the '*Geomorphic Wetlands of the Swan Coastal Plain*' dataset. This dataset contains information on geomorphic wetland types and assigns management categories that guide the recommended management approach for each wetland area. The wetland management categories and management objectives are listed in **Table 2**.

Table 2. DBCA wetland management categories (Semeniuk 1995).

Category	Description	Management Objectives
Conservation	Wetlands support a high level of ecological attributes and functions.	Highest priority wetlands. Objective is to preserve and protect the existing conservation values of the wetlands through various mechanisms including: • Reservation in national parks, crown reserves and State owned land, • Protection under Environmental Protection Policies, and • Wetland covenanting by landowners. No development or clearing is considered appropriate. These are the most valuable wetlands and any activity that may lead to further loss or degradation is inappropriate.
Resource Enhancement	Wetlands which may have been partially modified but still support substantial ecological attributes and functions	Priority wetlands. Ultimate objective is to manage, restore and protect towards improving their conservation value. These wetlands have the potential to be restored to Conservation category. This can be achieved by restoring wetland function, structure and biodiversity.
Multiple Use	Wetlands with few remaining attributes and functions	Use, development and management should be considered in the context of ecologically sustainable development and best management practice catchment planning through landcare.

There are no wetlands mapped within the subject site. Multiple Use (MU) category wetlands are located approximately 285 m to the north, 661 m to the west and 558 m to the east of the subject site (refer to **Figure 3**).

Additionally, a Conservation Category (CC) wetland is located approximately 480 m to the northwest of the subject site.

3 EXTRACTION ACTIVITIES

The quarry will cover an area of approximately 9.6 ha, with a current maximum elevation ranging from 5 m AHD to 1.5 m AHD. It will be excavated to an elevation of 1 m AHD commencing in the northeast of the subject site and head in a south westerly direction. Extraction activities will be divided into five stages, each will be no greater than 2.0 ha in size (refer to **Appendix A**).

It is estimated that the total maximum volume of material to be removed will be approximately 300,000 m^3. Over a five year period, a maximum of approximately 60,000 m^3 will be excavated each year, depending on supply and demand.

Earthen bunds for noise mitigation will be constructed with topsoil and overburden that will be stripped from the extraction footprint and other areas on the northeastern boundary. Construction of the bunds will be undertaken with an excavator and loader.

The planned end use of the quarry is to restore a natural soil profile and return the extraction area to pasture, ensuring that there is no net loss of agricultural land.

3.1.1 Sand Extraction

The sand and limestone will be excavated by an excavator, bulldozer or loader to a stockpile or loaded directly to waiting trucks for transport. A summary of the proposed sand and limestone extraction activities are provided below:

- Excavation will commence in the northeast of the quarry and move in a south westerly direction while maintaining a 10 m buffer from the dripline of the Tuart trees. The face and walls of the pit will act as noise barriers.
- Upon completion of each section of quarry, the section will be reformed and back filled using a combination of equipment such as a tracked bobcat, excavator and front-end loader, where subgrade material is available, to achieve the proposed final contours.
- At the end of excavation, the noise bunds will be removed, and the floor of the quarry will be deep ripped, covered by overburden and topsoil, and rehabilitated to a constructed soil.

3.1.2 Final Contours

The final surface contours of the quarry will be approximately 1 m AHD.

Slopes of the batters at the end of excavation will be retained at 1:6 vertical to horizontal.

3.1.3 Water Usage

Water is only required for dust suppression within the quarry and the access road. Water will be sourced onsite from an existing bore. A DWER licence will be obtained for the extraction of water following approval.

4 POTENTIAL IMPACTS AND MANAGEMENT

This Section provides and overview of the potential impacts to water resources associated with the proposed land use, and the proposed management measures to address the identified impacts.

4.1 Surface Water

The current water cycle within the subject site consists of inputs from rainwater flowing downhill in a north westerly direction into the wider drainage system. The development is not proposing to alter this process, as there are no drainage lines within the proposed extraction area.

There are no wetlands mapped within the subject site. MU category wetlands are located approximately 285 m to the north, 661 m to the west and 558 m to the east of the subject site (refer to **Figure 3**).

Additionally, a CC wetland is located approximately 480 m to the northwest of the subject site.

The proposed activities are not proposing to alter the natural surface flow process and therefore no impacts to the wetlands are anticipated.

4.2 Drainage

Potential impacts associated with sedimentation and erosion from stormwater runoff during the operation of the pit will be minimised by the construction of diversion drains around the excavation areas to divert clean water away from the pit and contain any potentially sediment laden surface water within the pit.

The DWER recommendation is that surface water runoff produced within the excavation area from the two hour, 1 in 10 (10%) annual exceedance probability event should be contained within the pit (DoW 2019). Rainfall intensity has been calculated using the Bureau of Meteorology (BoM) Intensity-Frequency-Duration (IFD) data system (BoM 2021), which yields the two hour 1 in 10% (10%) annual exceedance probability event for the site at 41.3 mm. For every 2 ha area open for excavation at any time a holding volume of 826 m^3 is required. The required holding volume can be readily achieved within the excavated pit. Given a minimum excavation width of 80 m, and excavation progressing sequentially across the five stages, sufficient storage capacity will be established during the early phases of extraction. Specifically, once approximately 11 m of excavation length has been achieved to a depth of 1 m, the available in-situ storage volume will exceed the required 826 m^3, thereby providing adequate temporary detention capacity for the design rainfall event.

During excavation activities, the surface will be internally drained, with the gradients in the stages being constructed to ensure that no surface water runoff occurs.

A risk assessment relating to surface water and stormwater runoff in consideration of the proposed management measures is provided below. The residual risk associated with sedimentation and erosion from stormwater runoff during the operation of the extractive industry is considered low.

Table 3. Risk assessment associated with surface water and stormwater.

Hazard	Source of Hazard	Potential Impacts	Mitigation	Likelihood	Consequence	Residual Risk
Erosion and sedimentation	Uncontrolled and contaminated stormwater runoff	Erosion and sedimentation resulting in poor surface water quality in surrounding waterways.	Construction of diversion drains around the excavation areas to divert clean water away from the pit and contain any potentially sediment laden surface water within the pit. Excavation undertaken with a gradient to ensure that stormwater is contained within the excavation footprint.	1	2	Low

4.3 Groundwater

Groundwater will not be extracted or dewatered during the operation of the pit and therefore, no impacts to groundwater levels are proposed.

Maximum excavation levels have been determined to ensure at least 0.5 m separation from the maximum groundwater level will be maintained at all times. The final contours of the pit will provide an undulating surface at approximately 1 m AHD. This will provide a separation of at least 0.5 m between the final contours and the maximum groundwater elevation. As previously discussed, a safety factor has been applied to these calculations taking into account historic groundwater levels to ensure annual variability does not preclude this separation. This separation to groundwater is consistent with advice provided by the DWER and subsequently many previously approved extractive industry operations in the southwest.

The specific 2 m separation distance was originally recommended for operations in highly sensitive environments such as Public Drinking Water Areas (PDWA) (refer to *Water Quality Protection Note 15*). Furthermore, it is noted that the *State Planning Policy 2025* recommends a 0.6 m to 1.5 m separation distance from the discharge point of an onsite sewage system to groundwater. As opposed to sewage systems, extractive industries are not associated with any environmental discharges (excluding accidental spills which can occur in any land use). The extraction and processing of sand is a chemically free operation with the liquids used being lubricants for machinery and fuel. There will be no storage of chemicals or fuel on the subject site. Therefore, a 0.5 m separation to groundwater is deemed to be suitable in consideration of the low risk nature of the operation.

Table 4. Risk assessment associated with groundwater.

Hazard	Source of Hazard	Potential Impacts	Mitigation	Likelihood	Consequence	Residual Risk
Contamination of groundwater	Machinery	Contamination of groundwater	Maintenance of at least 0.5 m separation from groundwater at all times.	1	2	Low

4.4 Hydrocarbons and Dangerous Goods Management

Hydrocarbons are the only dangerous goods that will be utilised within the proposed subject site for the operation of machinery. However, storage of hydrocarbons on the subject site will not occur.

Servicing of machinery and equipment will not occur onsite further reducing the possibility of contamination.

There is the minor possibility for soil and water contamination as a result of incidental hydrocarbon leakages or spills during the operation of machinery. In such instances the management measures specified below will be implemented.

Table 5. Hydrocarbon and dangerous goods management measures.

Timing	Management Measure
During pit operations	Mobile refuelling of equipment and vehicles will be undertaken on site by a mobile fuelling truck on a hard stand area outside of the pit area.
	Spill kits containing appropriate equipment for control, containment and cleanup of hydrocarbon and chemical spills will be available in appropriate locations onsite and maintained.
	No vehicles or machinery are to be serviced or cleaned within the subject site.

A risk assessment to determine the residual risk associated with the uncontrolled discharge of contaminants is provided below. The risk assessment indicates that with the application of suitable management measures the potential risk associated with uncontrolled discharges is 'Low'.

Table 6. Risk assessment associated with the uncontrolled discharge of contaminants.

Hazard	Source of Hazard	Potential Impacts	Mitigation	Likelihood	Consequence	Residual Risk
Uncontrolled discharge of contaminants to land	Machinery	Contamination of soils and/or water	Refer to Management Measures provided in **Table 6**.	1	2	Low

REFERENCES

Accendo Australia (2026). *365 Mallokup Road, Stirling Estate Environmental Management Plan*. Busselton, WA.

Department of Parks and Wildlife (DBCA) (2004). *Geomorphic Wetlands of the Swan Coastal Plain dataset*.

Department of Water (DoW) (2014). *South West Region Guideline, Water resource considerations for extractive industries.* DoW, Perth WA.

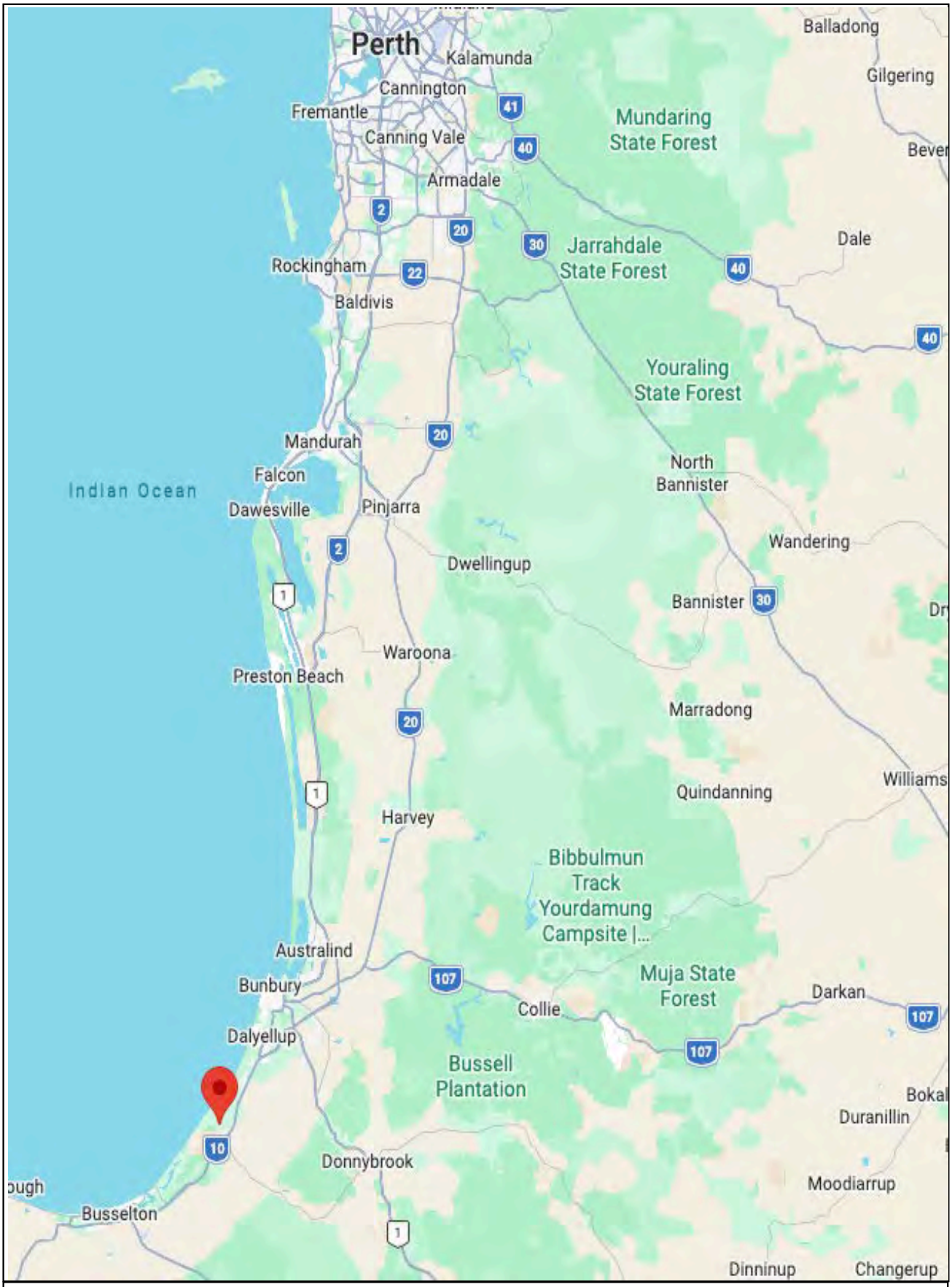
Environmental Protection Authority (EPA) (2006). *Guidance Statement No.10 for the Assessment of Environmental Factors (in accordance with the EP Act 1986: Levels of Assessment for Proposals Affecting Natural Areas Within the System 6 Region and Swan Coastal Plain Portion of the System 1 Region.*

Environmental Protection Authority (EPA) (2009). *South West Regional Ecological Linkages.* Bulletin No 8. Retrieved from: http://epa.wa.gov.au/EPADocLib/3040_SWREL_EPB821009.pdf

Heddle, E.M., Loneragan, O.W. and Havel, J.J. (1980). *Darling Systems – Vegetation Complexes, In: Atlas of Natural Resources Darling System*, Western Australia, Department of Conservation and Environment, Perth.

Western Australian Planning Commission (WAPC) (2007). *Planning Bulletin No. 64: Acid Sulfate Soils*, Western Australian Planning Commission, Western Australia.

FIGURES



PROJECT	365 Mallokup Road,Stirling Estate
DRAWING TITLE	Figure 1 – Site Locality
CLIENT	Dunkley Holdings Pty Ltd

Project Number	Drawing Number	Revision
2573	Figure 1	A

Designed NC
Drawn PN
Checked
Approved

Date 08/04/2026
Local Authority Shire of Capel
Sheet 1 of 1

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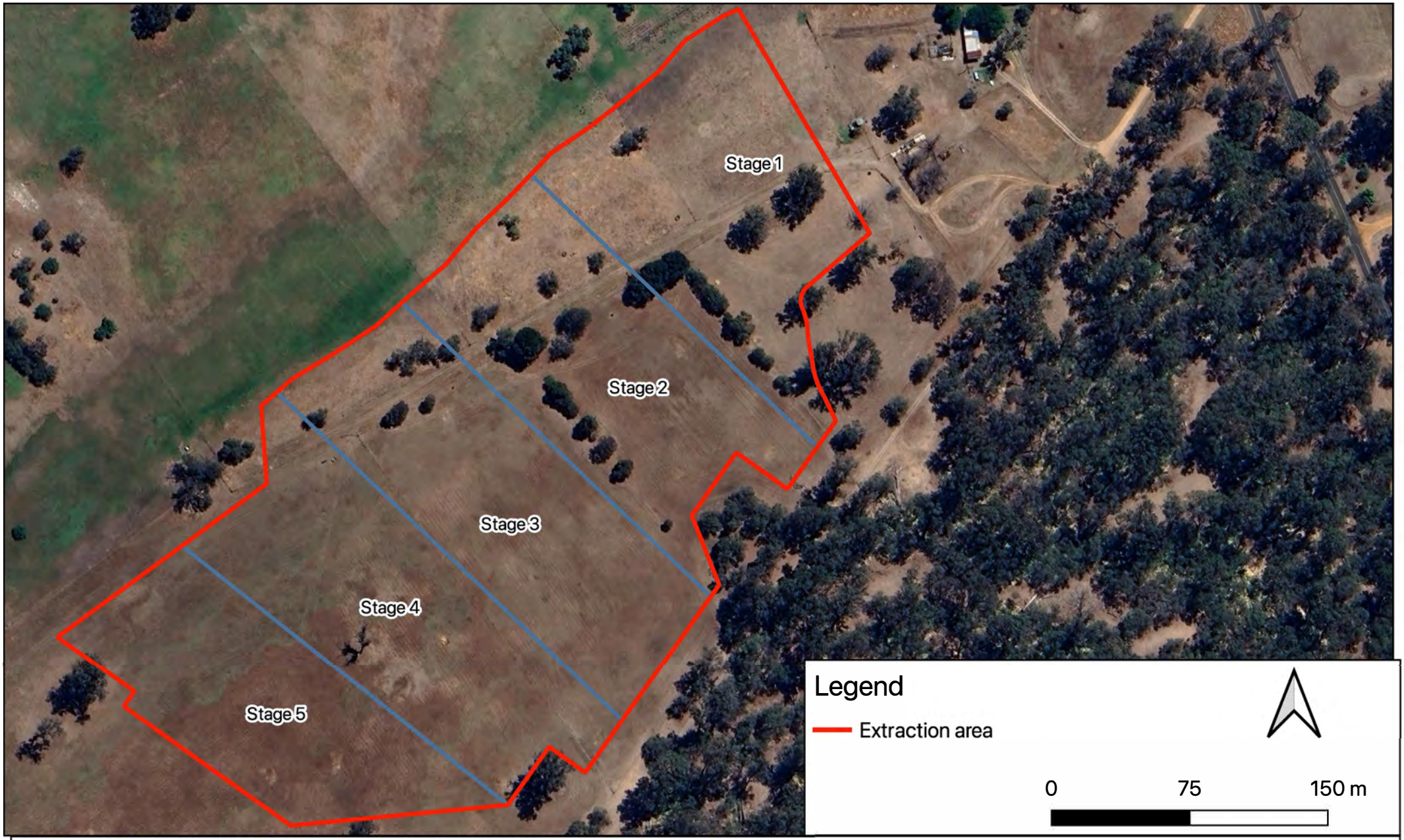

PROJECT	365 Mallokup Road, Stirling Estate
DRAWING TITLE	Figure 2- Site Extent
CLIENT	Dunkley Holdings Pty Ltd

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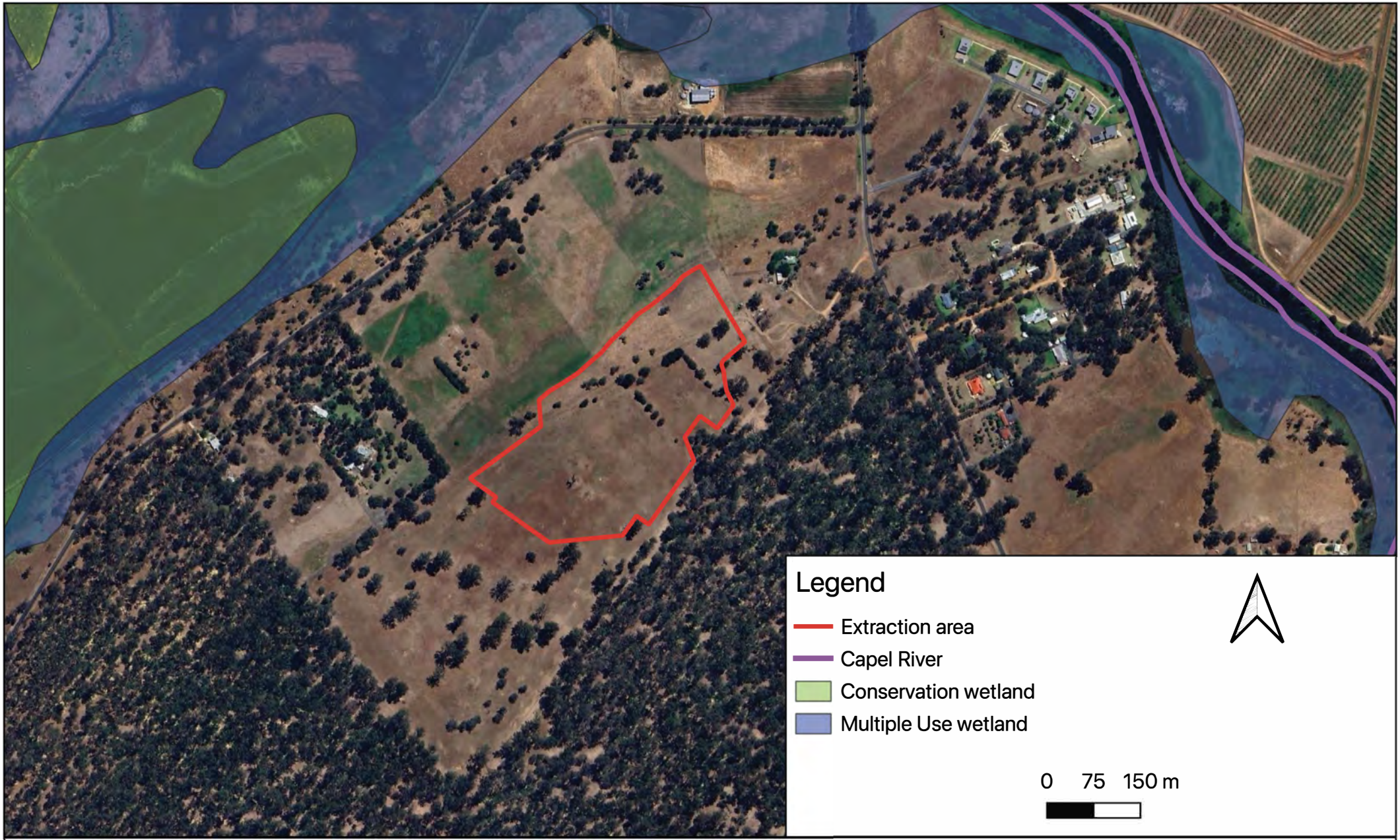
Project Number	2573	Designed	NC
Drawing Number	Figure 2	Drawn	PN
Revision	A	Checked	
Date	05/05/2026	Approved	
Sheet 1 of 1		Local Authority	Shire of Capel



PROJECT	365 Mallokup Road, Stirling Estate
DRAWING TITLE	Figure 3- Surface Water Features
CLIENT	Dunkley Holdings Pty Ltd

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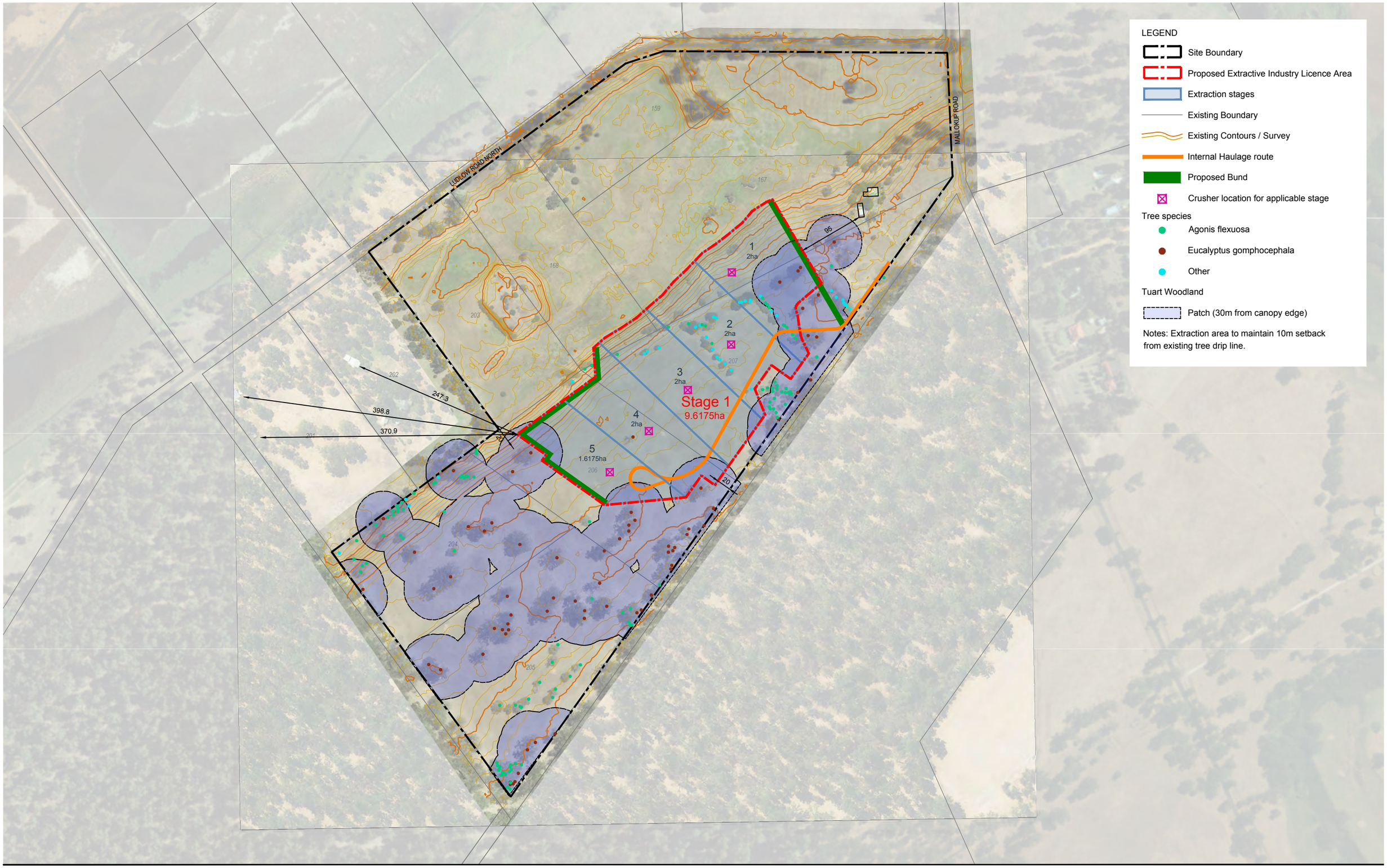
Project Number	2573	Designed	NC
Drawing Number	Figure 3	Drawn	PN
Revision	A	Checked	
Date	02/04/2026	Approved	
Sheet 1 of 1		Local Authority	Shire of Capel

APPENDIX A – EXCAVATION WORKS PLAN



Excavation Works Plan

Mallokup Road, Stirling Estate

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Date: 26 May 2026 Scale: 1:5000 @ A3 1:10,000 @ A1 File: **23-434 EX01A** Staff: HK JJ Checked: DL

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APPENDIX B – GROUNDWATER MONITORING REPORT

24 November 2025

Your Ref:
Our Ref: H23080Bv1

Element
L18 191 St Georges Terrace
Perth WA 6000
ATTENTION: Daniel Lewis

Dear Daniel,

LOTS 159, 168, 167, 203-207 (No. 365) MALLOKUP RD, STIRLING ESTATE
GROUNDWATER MONITORING REPORT

Please find below Hyd2o's report detailing results of the 2024-2025 groundwater monitoring program undertaken across the winters of 2024 and 2025 at Lots 159, 168, 167, and 203–207 (No. 365), Mallokup Rd, Capel (herein referred to as *the site*).

The program involved the installation and monitoring of groundwater levels at five site bores and two external Department of Water and Environmental Regulation (DWER) bores. Monitoring was undertaken over two winter periods (2024 and 2025).

This report has been prepared suitable for agency submission to summarise the data collected and provide groundwater contours across the site for use in establishing a suitable extractive industries floor level.

1. MONITORING DATA AND MGL/AAMGL CALCULATION

Hyd2o managed the installation of bores by Edrill at the site on 5 April 2024. The total of five groundwater monitoring bores were installed using a drill rig and constructed suitable for water level and quality monitoring. All bores were surveyed to Australian Height Datum. Bore logs are presented in Attachment A, with a plan showing the site and location of all relevant groundwater monitoring bores (including DWER bores) provided as Figure 1.

Groundwater level monitoring was undertaken monthly on 10 occasions across both winters. Measurements were collected in April, August, September, October and November 2024, and in May, August, September, October and November 2025.

2. MONITORING RESULTS

Groundwater levels recorded at all sites and DWER bores are included in Attachment B.

Peak groundwater levels during the monitoring period occurred in October 2025 at bore MB5 (1.26 mAHD). Three bores—MB2, MB3 and MB4—recorded their highest levels in September 2025 at 0.70 mAHD, 0.97 mAHD and 1.00 mAHD respectively. Bore MB1 recorded its maximum level in November 2025 at 0.46 mAHD.

Bore MB1 recorded the lowest groundwater level among all monitoring bores during both the 2024 and 2025 monitoring periods, despite being located furthest from the Capel River and the Stirling Wetlands compared to the other site bores. This result across consecutive monitoring years indicates that it is unlikely to be an isolated or anomalous event. Reasons for this are unclear however it is possible this may be due to localised drawdown associated

with groundwater uptake by the extensive Tuart (*Eucalyptus gomphocephala*) forest located along the southern and western boundaries of the site.

The DWER bores groundwater levels have been recorded since 1978 (BY24A) and 1984 (BN1S), with the DWER bores long term historical hydrographs included as Attachment C. The average annual maximum groundwater level (AAMGL) for these DWER bores were calculated across 2000 – 2025 for this assessment, considered more representative of recent levels and climate.

DWER bores BY24A and BN1S had their peak levels during the 2024-2025 monitoring period both in August 2025 with the recorded levels of 2.00 mAHD and 1.55 mAHD respectively being the highest levels of the last 25 years.

Table 1 presents the AAMGL values and shows that peak groundwater levels in winter 2024 and 2025 were above the long-term average.

A correction factor was applied to the site bores based on the difference between DWER bore readings and their calculated AAMGL (2000–2025). The corrected site AAMGL values are presented in Table 2 and contoured in Figure 1.

A depth from natural surface to AAMGL map is contained as Figure 2.

Table 1: DWER Monitoring Bore AAMGL

Bore	Period of Record	Period for AAMGL Calculation	AAMGL (mAHD)	2000-2025 MGL (mAHD)	Max Level 2025 (mAHD)	Difference to AAMGL (m)
BN1S	1984 – 2025	2000 – 2025	0.85	1.55	1.55 (Aug)	-0.70
BY24A	1978 – 2025	2000 – 2025	1.63	2.00	2.00 (Aug)	-0.37
Correction Factor to Apply to Site Bores for AAMGL (m)						-0.54

Table 2: Site AAMGL

Bore	Max Level 2025 (mAHD)	Correction Factor (m)	AAMGL (mAHD)
MB1	0.46 (Nov)	-0.54	-0.08
MB2	0.70 (Sept)		0.16
MB3	0.97 (Sept)		0.43
MB4	1.00 (Sept)		0.46
MB5	1.26 (Oct)		0.72

3. REFERENCES

Department of Water and Environmental Regulation, Water Information Reporting, accessed November 2025.

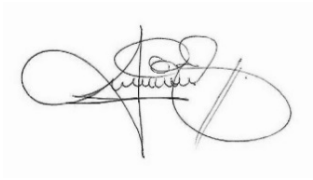
Department of Water and Environmental Regulation, Water Register, accessed November 2025.

Hyd2o (2024), Lots 159, 168, 167, 203-207 (No. 365) Mallokup Rd, Stirling Estate Groundwater Monitoring Report 2024, December 2024

McVicar, T. R., & Roderick, M. L. (2014). The relationship between groundwater and vegetation: A review of the literature. Hydrology and Earth System Sciences, 18(1), 1–12.

Should you have any queries regarding this report, please do not hesitate to contact Andre Righetti or Sasha Martens of this office.

Yours sincerely,

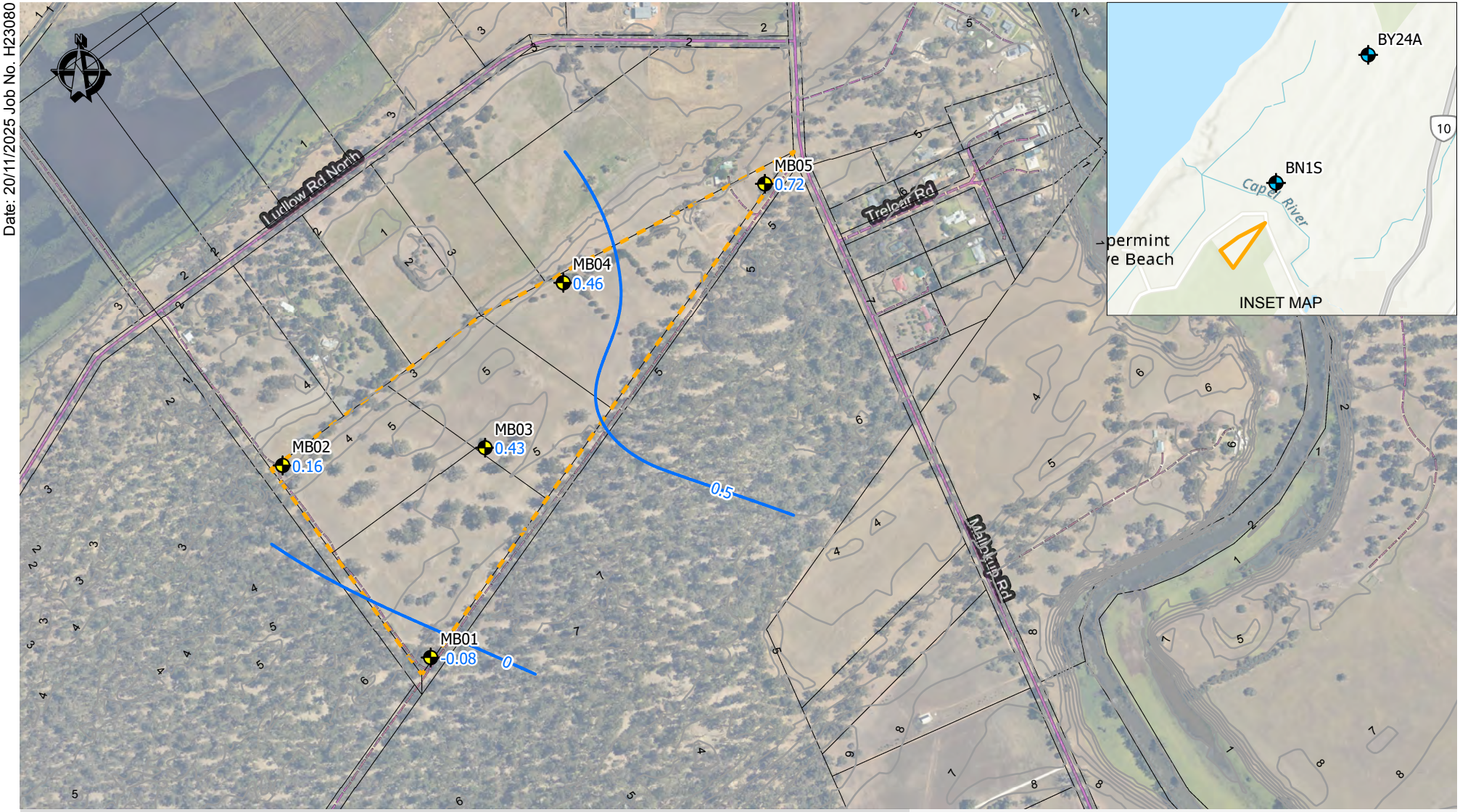


Andre Righetti
Environmental Engineer / Hydrologist

Attachments

Figure 1: Bore Location Plan & AAMGL Mapping
Figure 2: Depth to AAMGL Mapping
Attachment A: Bore Logs
Attachment B: Groundwater Levels Summary
Attachment C: Long Term DWER Hydrographs

FIGURES



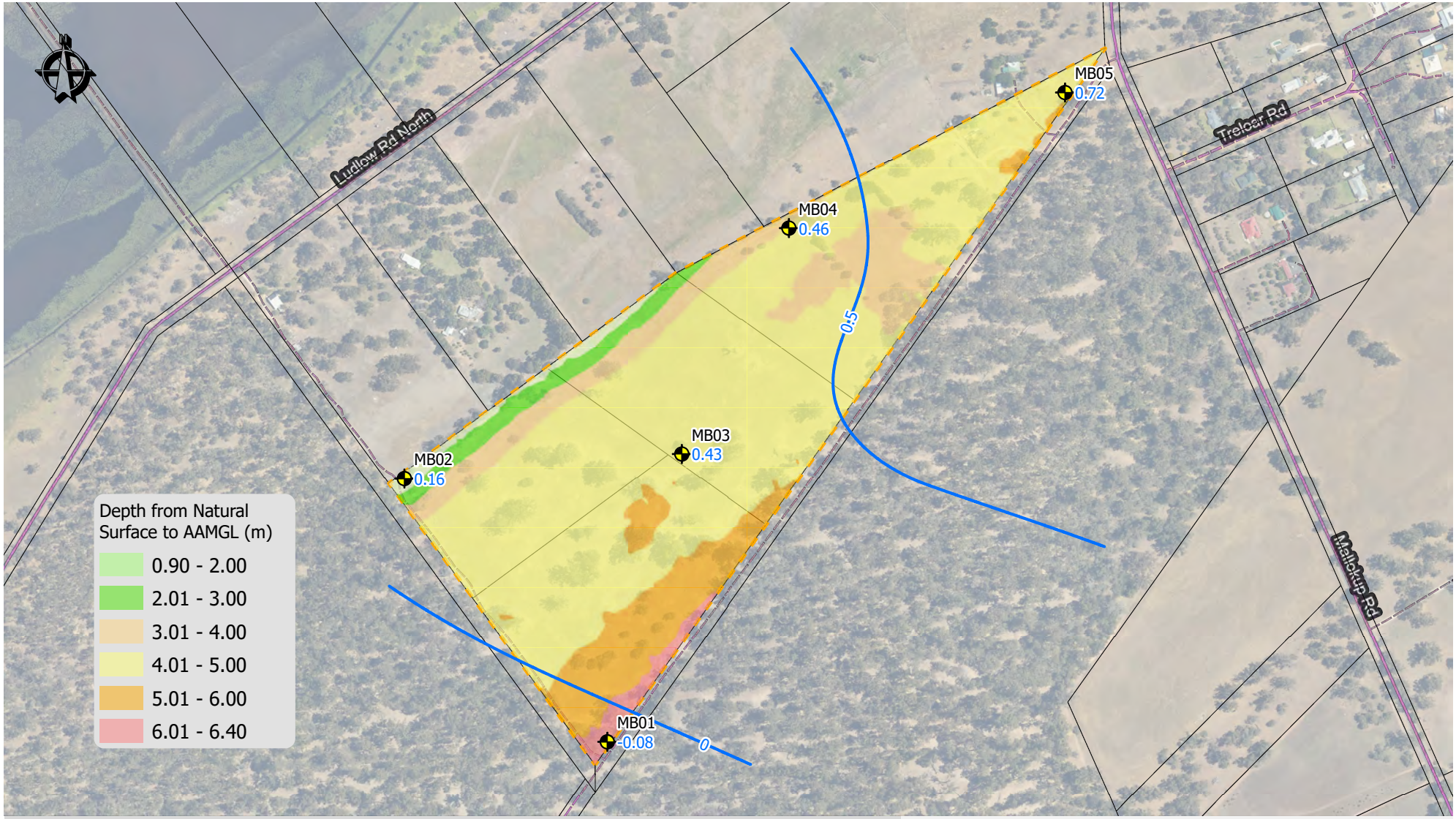
hyd2o

Lots 159, 168, 167, 203-207 (No.365) Mallokup Rd
Stirling Estate Capel Monitoring

AAMGL Mapping

Figure 1

Date: 20/11/2025 Job No. H23080



Site Boundary

Site Groundwater Monitoring Bore

AAMGL Contour (mAHD)

0 90 180 Meters

Data Source:
LiDAR DEM - DWER
Aerial Image - Landgate

hyd2o

Lots 159, 168, 167, 203-207 (No.365) Mallokup Rd
Stirling Estate Capel Monitoring

Depth to AAMGL Mapping

Figure 2

ATTACHMENT 1

Bore Logs via Hyd2o 2024

Lithological Log

Hyd2o
Suite 1 387 Hay St
Subiaco, WA 6008

PO Box 1055
Subiaco WA 6904

Date :	**5/04/2024**				
Client :	**Element**	Job Number :	H24008	Bore Name	
Project:	**Stirling Estate GW Monitoring**	Start Hole :	**8:15**		
Easting	**363542.12**	End Hole :	**9:30**	**MB1**	
Northing	**6288722.452**	Logged by :	**AFR**		
Datum:	GDA94	Total Depth :	**8.0**		
Drill type:	Drill Rig Auger	RL Top of Casing :	**6.765**		
Hole diameter:	2.5 inches	RL Nat Surface :	**6.165**		

support	backfill	water	Slot / Screen Depth	Depth (metres)	Soil Characteristics					
					Colour	Particle Size	Texture	Organic Content	Moisture	Comment
PVC (Class 9)	CEMENT			0.5m	Brown Dark Brown	Fine to Medium	Sand	None	Dry	
	BENTONITE SEAL			1.0m	Brown					
	GRAVEL			1.5m						
				2.0m	Brown Light Brown					
				2.5m	Light Brown					
				3.0m	Brown					
				3.5m	Beige Brown		Sand with minor limestone and shells			
				4.0m						
				4.5m						
				5.0m						

COLOUR : Black, White, Beige
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

MOISTURE : Dry, Slightly Moist, Moist, Saturated

Static Water Level

Date	
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

Lithological Log

Hyd2o
Suite 1 387 Hay St
Subiaco, WA 6008

PO Box 1055
Subiaco WA 6904

Date :	**5/04/2024**				
Client :	**Element**	Job Number :	H24008	Bore Name	
Project:	**Stirling Estate GW Monitoring**	Start Hole :	**8:15**		
Easting	**363542.12**	End Hole :	**9:30**	**MB1**	
Northing	**6288722.452**	Logged by :	**AFR**		
Datum:	GDA94	Total Depth :	**8.0**		
Drill type:	Drill Rig Auger	RL Top of Casing :	**6.765**		
Hole diameter:	2.5 inches	RL Nat Surface :	**6.165**		

support	backfill	water	Slot / Screen Depth	Depth (metres)	Soil Characteristics					
					Colour	Particle Size	Texture	Organic Content	Moisture	Comment
PVC (Class 9)	GRAVEL	▽		5.5m	Light Brown	Fine to Medium	Gravelly Sand (limestone and shell)	None	Dry	
				6.0m					Moist	
				6.5m	Light Brown Beige					
				7.0m	Dark Beige		Sand		Saturated	
				7.5m						
				8.0m						end of hole at 8.0 m
				8.5m						
				9.0m						
				9.5m						
				10.0m						

COLOUR : Black, White, Biege
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

MOISTURE : Dry, Slightly Moist, Moist, Saturated

Static Water Level

Date	8/04/2024
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

Lithological Log

Hyd2o
Suite 1 387 Hay St
Subiaco, WA 6008

PO Box 1055
Subiaco WA 6904

Date :	**5/04/2024**	Job Number :	H24008	Bore Name
Client :	**Element**	Start Hole :	**9:45**	**MB2**
Project:	**Stirling Estate GW Monitoring**	End Hole :	**11:00**	
Easting	**363288.109**	Logged by :	**AFR**	
Northing	**6289051.86**	Total Depth :	**5.0**	
Datum:	GDA94	RL Top of Casing :	**2.024**	
Drill type:	Drill Rig Auger	RL Nat Surface :	**1.424**	
Hole diameter:	2.5 inches			

support	backfill	water	Slot / Screen Depth	Depth (metres)	Soil Characteristics: Colour	Particle Size	Texture	Organic Content	Moisture	Comment
PVC (Class 9)	CEMENT			0.5m	Dark Grey Black	Fine to Medium	Sand	Medium	Dry	
	BENTONITE SEAL			1.0m	Dark Grey		Clayey Sand	Low		
	GRAVEL	▽		1.5m	Dark Grey Light Brown			None	Slightly Moist	
				2.0m	Dark Grey Brown				Moist	
				2.5m	Brown					
				3.0m						
				3.5m	Dark Brown		Sandy Clay		Saturated	
				4.0m	Light Brown		Clayey Sand			
				4.5m						
				5.0m						end of hole at 5.0 m

COLOUR : Black, White, Beige
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

MOISTURE : Dry, Slightly Moist, Moist, Saturated

Static Water Level

Date	
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

Lithological Log

Hyd2o
Suite 1 387 Hay St
Subiaco, WA 6008

PO Box 1055
Subiaco WA 6904

Date :	**5/04/2024**				
Client :	**Element**	Job Number :	H24008	Bore Name	
Project:	**Stirling Estate GW Monitoring**	Start Hole :	**6:30**		
Easting	**363635.369**	End Hole :	**8:00**	**MB3**	
Northing	**6289082.42**	Logged by :	**AFR**		
Datum:	GDA94	Total Depth :	**8.0**		
Drill type:	Drill Rig Auger	RL Top of Casing :	**5.625**		
Hole diameter:	2.5 inches	RL Nat Surface :	**5.025**		

support	backfill	water	Slot / Screen Depth	Depth (metres)	Soil Characteristics					
					Colour	Particle Size	Texture	Organic Content	Moisture	Comment
PVC (Class 9)	CEMENT			0.5m	Grey Light Brown	Fine to Medium	Sand	Low	Dry	
	BENTONITE SEAL			1.0m	Brown			None		
	GRAVEL			1.5m	Light Brown					
				2.0m	Beige Light Brown					
				2.5m	Beige					
				3.0m						
				3.5m						
				4.0m			Gravelly Sand (limestone and shell)			
				4.5m	Beige Light Brown					
				5.0m						

COLOUR : Black, White, Beige
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

MOISTURE : Dry, Slightly Moist, Moist, Saturated

Static Water Level

Date	
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

Lithological Log

Hyd2o
Suite 1 387 Hay St
Subiaco, WA 6008

PO Box 1055
Subiaco WA 6904

Date :	**5/04/2024**				
Client :	**Element**	Job Number :	H24008	Bore Name	
Project:	**Stirling Estate GW Monitoring**	Start Hole :	**6:30**		
Easting	**363635.369**	End Hole :	**8:00**	**MB3**	
Northing	**6289082.42**	Logged by :	**AFR**		
Datum:	GDA94	Total Depth :	**8.0**		
Drill type:	Drill Rig Auger	RL Top of Casing :	**5.625**		
Hole diameter:	2.5 inches	RL Nat Surface :	**5.025**		

support	backfill	water	Slot / Screen Depth	Depth (metres)	Soil Characteristics					
					Colour	Particle Size	Texture	Organic Content	Moisture	Comment
PVC (Class 9)	GRAVEL	▽		5.5m	Beige Yellow	Fine to Medium	Gravelly Sand (limestone and shell)	None	Slightly Moist	
				6.0m					Moist	
				6.5m	Dark Beige		Sand		Saturated	
				7.0m						
				7.5m						
				8.0m	Beige Brown	Fine	Clayey Sand			end of hole at 8.0m
				8.5m						
				9.0m						
				9.5m						
				10.0m						

COLOUR : Black, White, Biege
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

MOISTURE : Dry, Slightly Moist, Moist, Saturated

Static Water Level

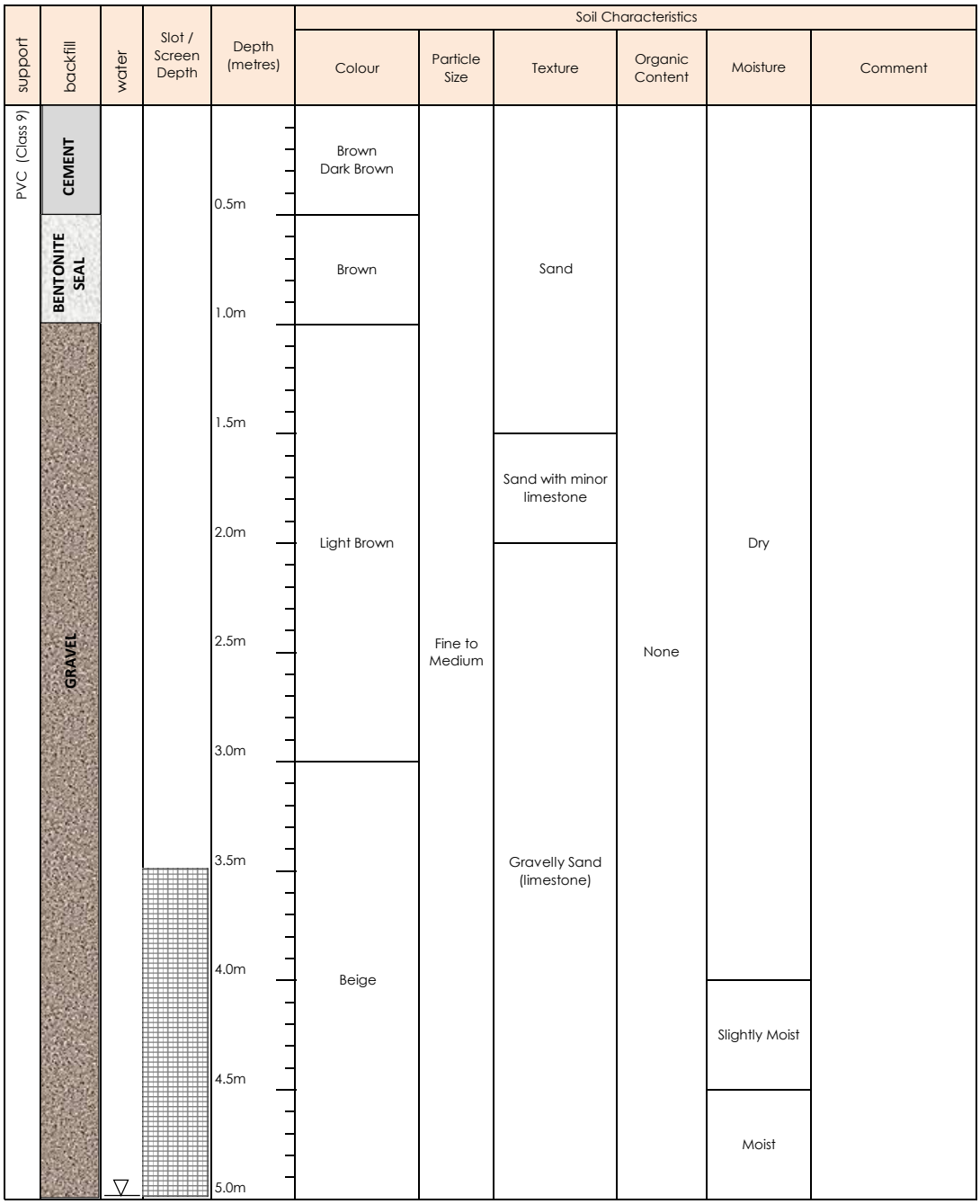
Date	8/04/2024
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

Lithological Log

Hyd2o
Suite 1 387 Hay St
Subiaco, WA 6008

PO Box 1055
Subiaco WA 6904

Date :	**4/04/2024**	Job Number :	H24008	Bore Name
Client :	**Element**	Start Hole :	**16:30**	
Project:	**Stirling Estate GW Monitoring**	End Hole :	**18:00**	**MB4**
Easting	**363769.406**	Logged by :	**AFR**	
Northing	**6289365.099**	Total Depth :	**6.5**	
Datum:	GDA94	RL Top of Casing :	**5.074**	
Drill type:	Drill Rig Auger	RL Nat Surface :	**4.474**	
Hole diameter:	2.5 inches			



COLOUR : Black, White, Beige
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

MOISTURE : Dry, Slightly Moist, Moist, Saturated

Static Water Level

Date	
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

Lithological Log

Hyd2o
Suite 1 387 Hay St
Subiaco, WA 6008

PO Box 1055
Subiaco WA 6904

Date :	**4/04/2024**		Job Number :	H24008	Bore Name
Client :	**Element**		Start Hole :	**16:30**	**MB4**
Project:	**Stirling Estate GW Monitoring**		End Hole :	**18:00**	
Easting	**363769.406**		Logged by :	**AFR**	
Northing	**6289365.099**		Total Depth :	**6.5**	
Datum:	GDA94		RL Top of Casing :	**5.074**	
Drill type:	Drill Rig Auger		RL Nat Surface :	**4.474**	
Hole diameter:	2.5 inches				

support	backfill	water	Slot / Screen Depth	Depth (metres)	Soil Characteristics					
					Colour	Particle Size	Texture	Organic Content	Moisture	Comment
PVC (Class 9)	GRAVEL			5.5m	Light Beige Grey	Fine to Medium	Gravelly Sand (limestone)	None	Saturated	
				6.0m			Clayey Sand			
					Grey					
				6.5m	Grey Brown	Fine	Clay			end of hole at 6.5m
				7.0m						
				7.5m						
				8.0m						
				8.5m						
				9.0m						
				9.5m						
				10.0m						

COLOUR : Black, White, Biege
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

MOISTURE : Dry, Slightly Moist, Moist, Saturated

Static Water Level

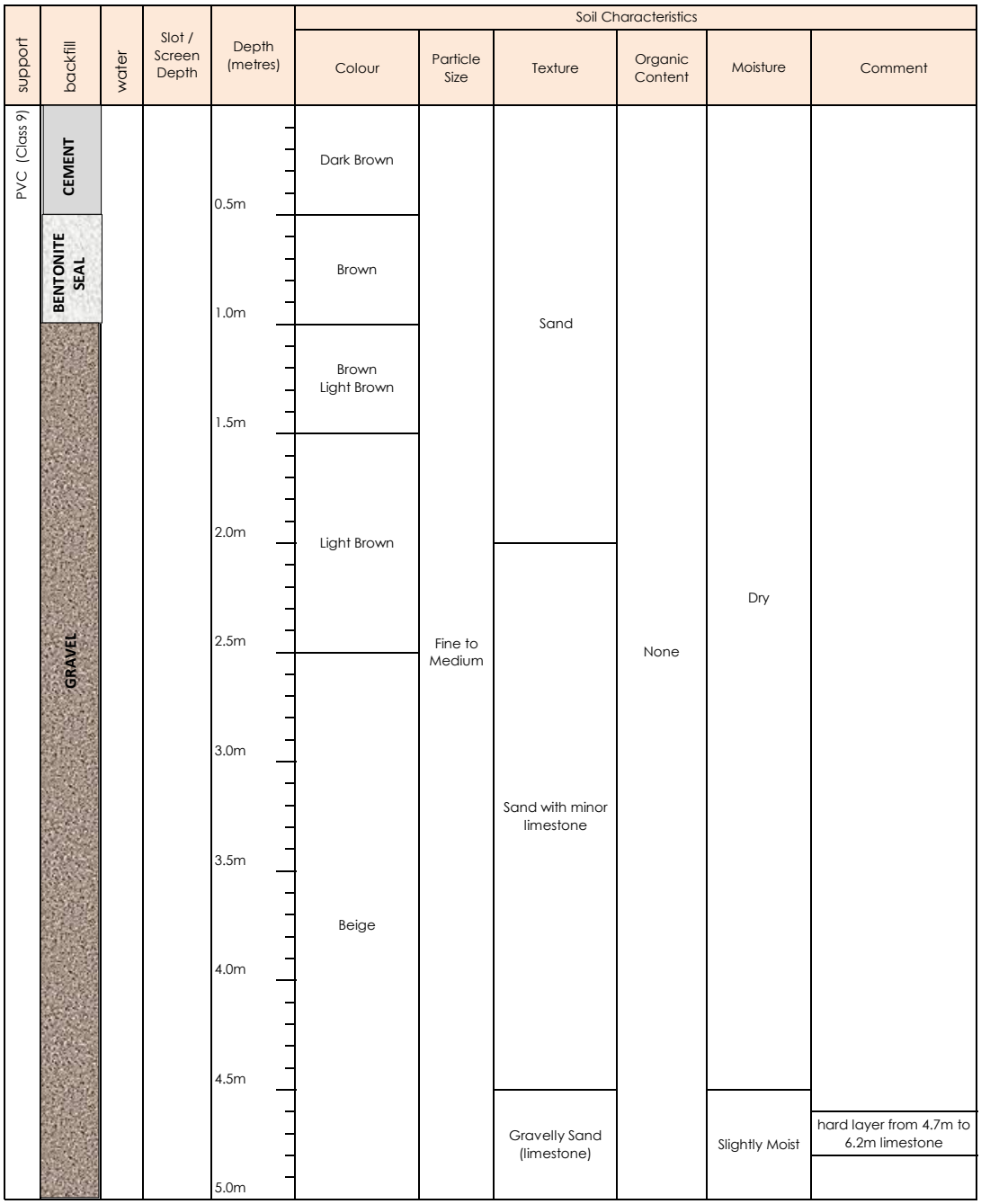
Date	
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

Lithological Log

Hyd2o
Suite 1 387 Hay St
Subiaco, WA 6008

PO Box 1055
Subiaco WA 6904

				Bore Name
Date :	**5/04/2024**	Job Number :	H24008	**MB5**
Client :	**Element**	Start Hole :	**11:15**	
Project:	**Stirling Estate GW Monitoring**	End Hole :	**13:30**	
Easting	**364115.012**	Logged by :	**AFR**	
Northing	**6289534.928**	Total Depth :	**8.0**	
Datum:	GDA94	RL Top of Casing :	**6.081**	
Drill type:	Drill Rig Auger	RL Nat Surface :	**5.481**	
Hole diameter:	2.5 inches			



COLOUR : Black, White, Beige
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

MOISTURE : Dry, Slightly Moist, Moist, Saturated

Static Water Level

Date	
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

Lithological Log

Hyd2o
Suite 1 387 Hay St
Subiaco, WA 6008

PO Box 1055
Subiaco WA 6904

				Bore Name
Date :	**5/04/2024**	Job Number :	H24008	**MB5**
Client :	**Element**	Start Hole :	**11:15**	
Project:	**Stirling Estate GW Monitoring**	End Hole :	**13:30**	
Easting	**364115.012**	Logged by :	**AFR**	
Northing	**6289534.928**	Total Depth :	**8.0**	
Datum:	GDA94	RL Top of Casing :	**6.081**	
Drill type:	Drill Rig Auger	RL Nat Surface :	**5.481**	
Hole diameter:	2.5 inches			

support	backfill	water	Slot / Screen Depth	Depth (metres)	Soil Characteristics: Colour	Particle Size	Texture	Organic Content	Moisture	Comment
PVC (Class 9)	GRAVEL	▽		5.5m	Beige	Fine to Medium	Gravelly Sand (limestone)	None	Slightly Moist	
				6.0m					Moist	
				6.5m						
				7.0m	Dark Beige		Clayey Sand		Saturated	
				7.5m						
				8.0m						end of hole at 8.0 m
				8.5m						
				9.0m						
				9.5m						
				10.0m						

COLOUR : Black, White, Biege
Dark/Medium/Light : Brown, Red, Orange, Yellow, Grey, Blue
Composition : Solid , Blemish, Mottle

PARTICLE SIZE : Fine, Medium, Course

TEXTURE : Sand, Loamy Sand, Clayey Sand
Silt, Loam, Sandy Loam, Clayey Loam
Clay, Sandy Clay

ORGANICS : High, Medium, Low

MOISTURE : Dry, Slightly Moist, Moist, Saturated

Static Water Level

Date	
Stickup above NS (m)	
Water Level bTOC (m)	
Water Level bNS (m)	

ATTACHMENT 2

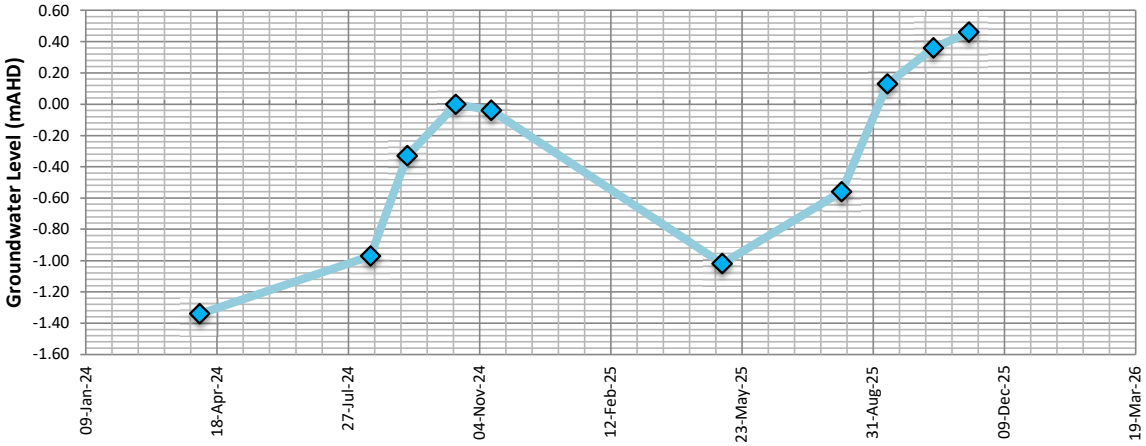
Groundwater Levels Summary

H23080 Stirling Estate Groundater Monitoring

MB1 Site Bore MB1

				Natural Surface (mAHD)	6.17
Data Analysis Period Start Date	1/01/2024	Easting	363542.12	Top of Casing (m AHD)	6.77
Data Analysis Period End Date	31/12/2025	Northing	6288722.452	End of Hole (mAHD)	

Report Date : 18/11/2025



Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
5/04/2024	8.10	-1.34	7.51
13/08/2024	7.73	-0.97	7.14
10/09/2024	7.09	-0.33	6.50
17/10/2024	6.77	0.00	6.17
13/11/2024	6.81	-0.04	6.21
8/05/2025	7.78	-1.02	7.19
7/08/2025	7.32	-0.56	6.73
11/09/2025	6.64	0.13	6.04
16/10/2025	6.40	0.36	5.81
12/11/2025	6.31	0.46	5.71

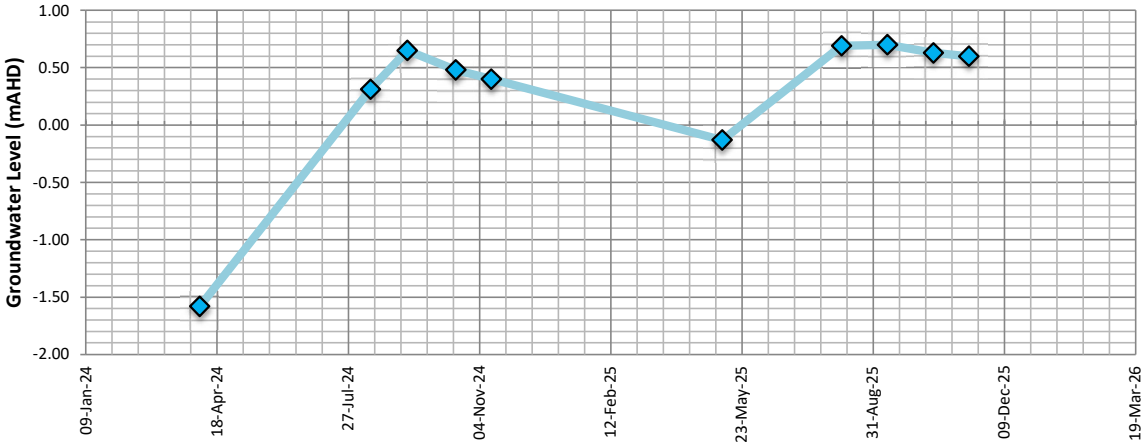
Minimum Recorded Level (mAHD)	-1.34
Maximum Recorded Level (mAHD)	0.46

H23080 Stirling Estate Groundater Monitoring

MB2 Site Bore MB2

Data Analysis Period Start Date	1/01/2024	Easting	363288.109	Natural Surface (mAHD)	1.42
Data Analysis Period End Date	31/12/2025	Northing	6289051.86	Top of Casing (m AHD)	2.02
				End of Hole (mAHD)	

Report Date : 18/11/2025



Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
5/04/2024	3.60	-1.58	3.00
13/08/2024	1.71	0.31	1.11
10/09/2024	1.37	0.65	0.77
17/10/2024	1.54	0.48	0.94
13/11/2024	1.62	0.40	1.02
8/05/2025	2.15	-0.13	1.55
7/08/2025	1.33	0.69	0.73
11/09/2025	1.32	0.70	0.72
16/10/2025	1.39	0.63	0.79
12/11/2025	1.42	0.60	0.82

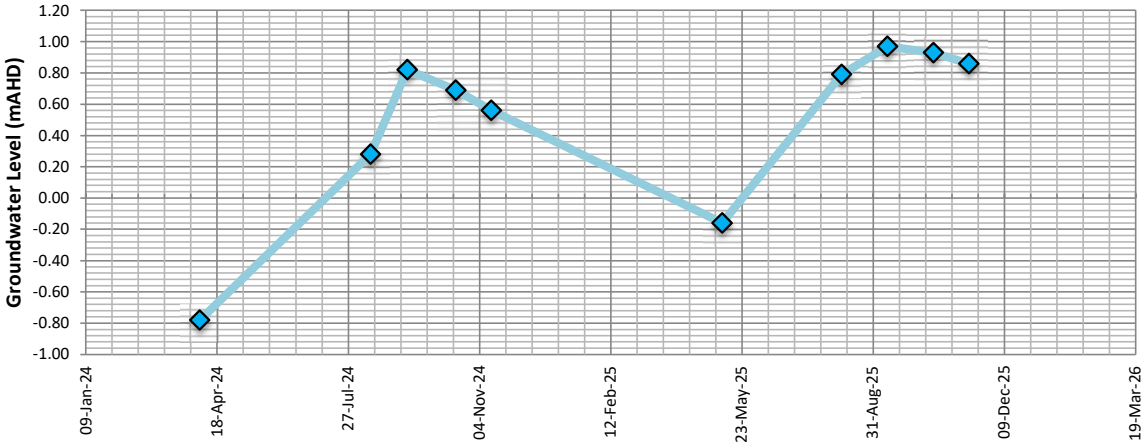
Minimum Recorded Level (mAHD)	-1.58
Maximum Recorded Level (mAHD)	0.70

H23080 Stirling Estate Groundater Monitoring

MB3 Site Bore MB3

Data Analysis Period Start Date	1/01/2024	Easting	363635.369	Natural Surface (mAHD)	5.03
Data Analysis Period End Date	31/12/2025	Northing	6289082.42	Top of Casing (m AHD)	5.63
				End of Hole (mAHD)	

Report Date : 18/11/2025



Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
5/04/2024	6.40	-0.78	5.81
13/08/2024	5.35	0.28	4.75
10/09/2024	4.81	0.82	4.21
17/10/2024	4.94	0.69	4.34
13/11/2024	5.07	0.56	4.47
8/05/2025	5.78	-0.16	5.19
7/08/2025	4.84	0.79	4.24
11/09/2025	4.66	0.97	4.06
16/10/2025	4.70	0.93	4.10
12/11/2025	4.77	0.86	4.17

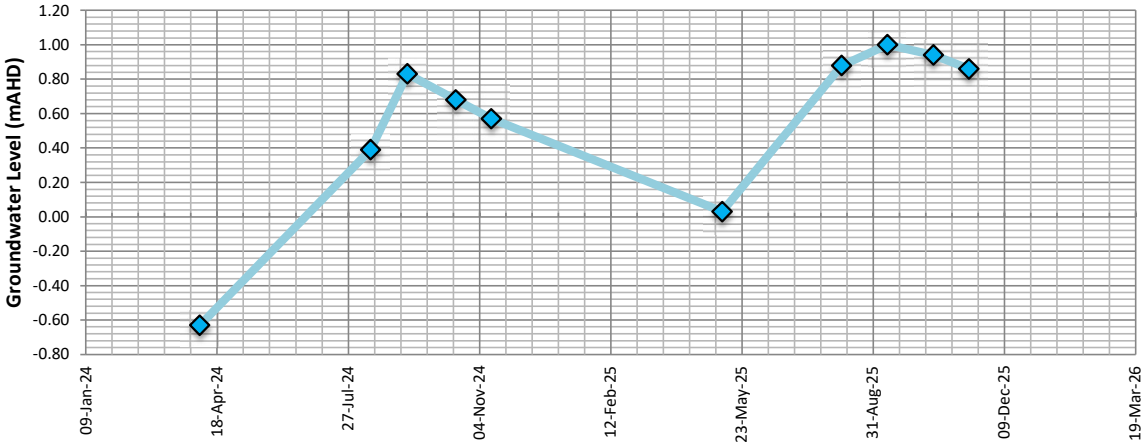
Minimum Recorded Level (mAHD)	-0.78
Maximum Recorded Level (mAHD)	0.97

H23080 Stirling Estate Groundater Monitoring

MB4 Site Bore MB4

				Natural Surface (mAHD)	4.47
Data Analysis Period Start Date	1/01/2024	Easting	363769.406	Top of Casing (m AHD)	5.07
Data Analysis Period End Date	31/12/2025	Northing	6289365.099	End of Hole (mAHD)	

Report Date : 18/11/2025



Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
5/04/2024	5.70	-0.63	5.10
13/08/2024	4.68	0.39	4.08
10/09/2024	4.24	0.83	3.64
17/10/2024	4.39	0.68	3.79
13/11/2024	4.50	0.57	3.90
8/05/2025	5.04	0.03	4.44
7/08/2025	4.19	0.88	3.59
11/09/2025	4.07	1.00	3.47
16/10/2025	4.13	0.94	3.53
12/11/2025	4.21	0.86	3.61

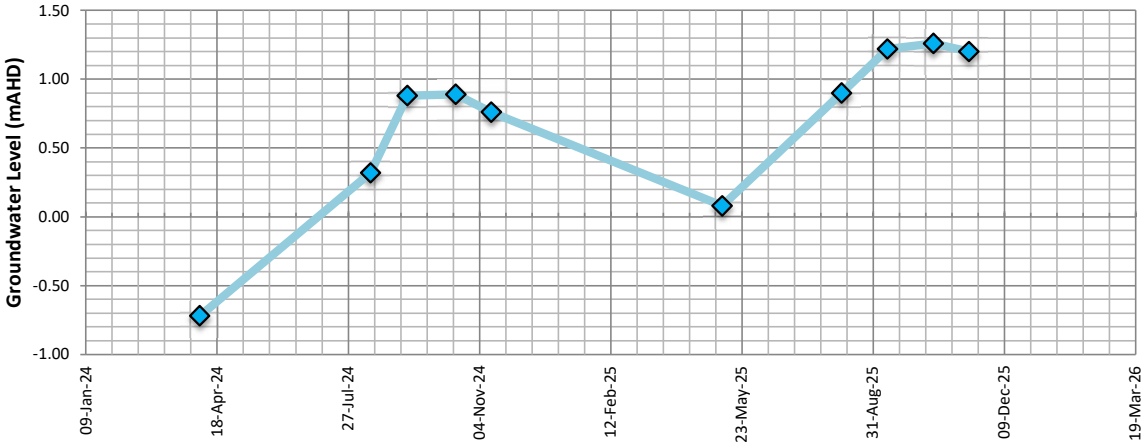
Minimum Recorded Level (mAHD)	-0.63
Maximum Recorded Level (mAHD)	1.00

H23080 Stirling Estate Groundater Monitoring

MB5 Site Bore MB5

Data Analysis Period Start Date	1/01/2024	Easting	364115.012	Natural Surface (mAHD)	5.48
Data Analysis Period End Date	31/12/2025	Northing	6289534.928	Top of Casing (m AHD)	6.08
				End of Hole (mAHD)	

Report Date : 18/11/2025



Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
5/04/2024	6.80	-0.72	6.20
13/08/2024	5.76	0.32	5.16
10/09/2024	5.20	0.88	4.60
17/10/2024	5.19	0.89	4.59
13/11/2024	5.32	0.76	4.72
8/05/2025	6.00	0.08	5.40
7/08/2025	5.18	0.90	4.58
11/09/2025	4.86	1.22	4.26
16/10/2025	4.82	1.26	4.22
12/11/2025	4.88	1.20	4.28

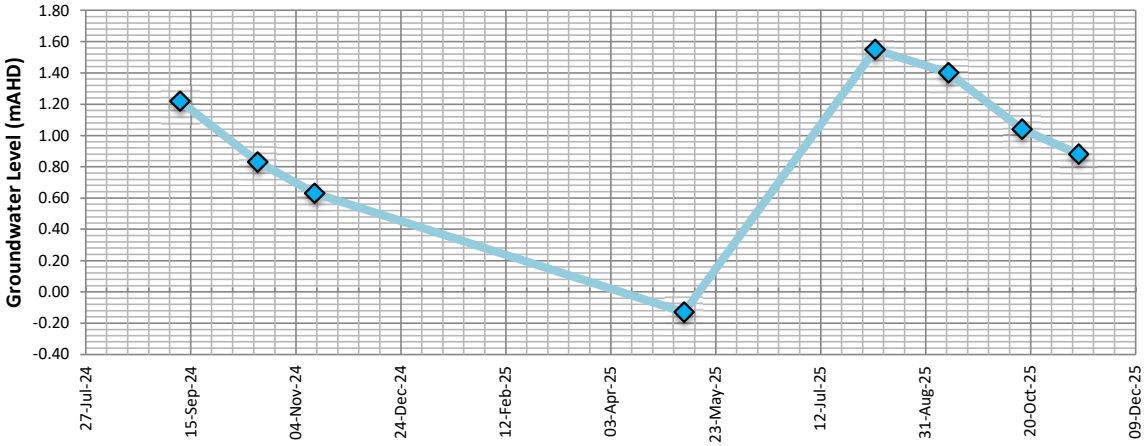
Minimum Recorded Level (mAHD)	-0.72
Maximum Recorded Level (mAHD)	1.26

H23080 Stirling Estate Groundater Monitoring

BN1S DWER Bore BN1S

				Natural Surface (mAHD)	
Data Analysis Period Start Date	1/01/2024	Easting	364379.54	Top of Casing (m AHD)	3.08
Data Analysis Period End Date	31/12/2025	Northing	6290391.45	End of Hole (mAHD)	

Report Date : 18/11/2025



Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
10/09/2024	1.86	1.22	
17/10/2024	2.25	0.83	
13/11/2024	2.45	0.63	
8/05/2025	3.21	-0.13	
7/08/2025	1.53	1.55	
11/09/2025	1.68	1.40	
16/10/2025	2.04	1.04	
12/11/2025	2.20	0.88	

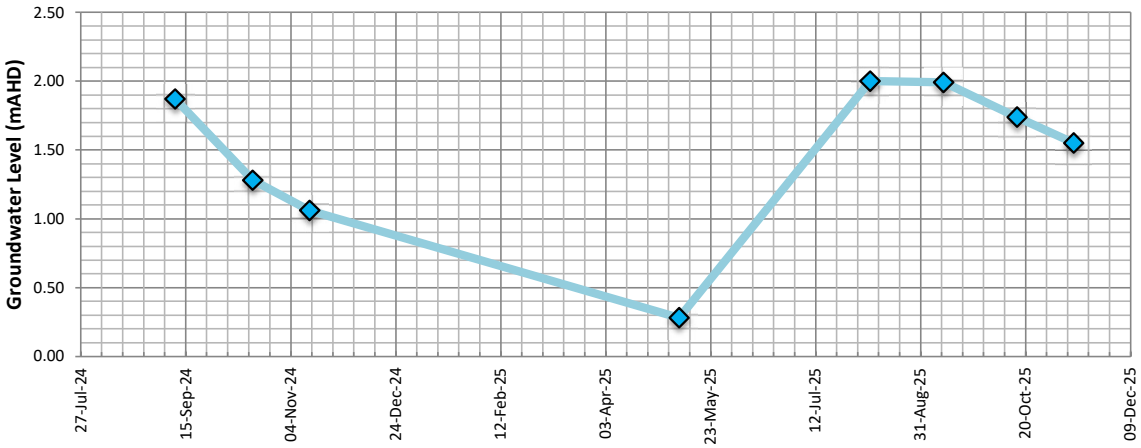
Minimum Recorded Level (mAHD)	-0.13
Maximum Recorded Level (mAHD)	1.55

H23080 Stirling Estate Groundater Monitoring

BY24A DWER Bore BY24A

Data Analysis Period Start Date	1/01/2024	Easting	366214.02	Natural Surface (mAHD)	
Data Analysis Period End Date	31/12/2025	Northing	6292938.49	Top of Casing (m AHD)	2.60
				End of Hole (mAHD)	

Report Date : 18/11/2025



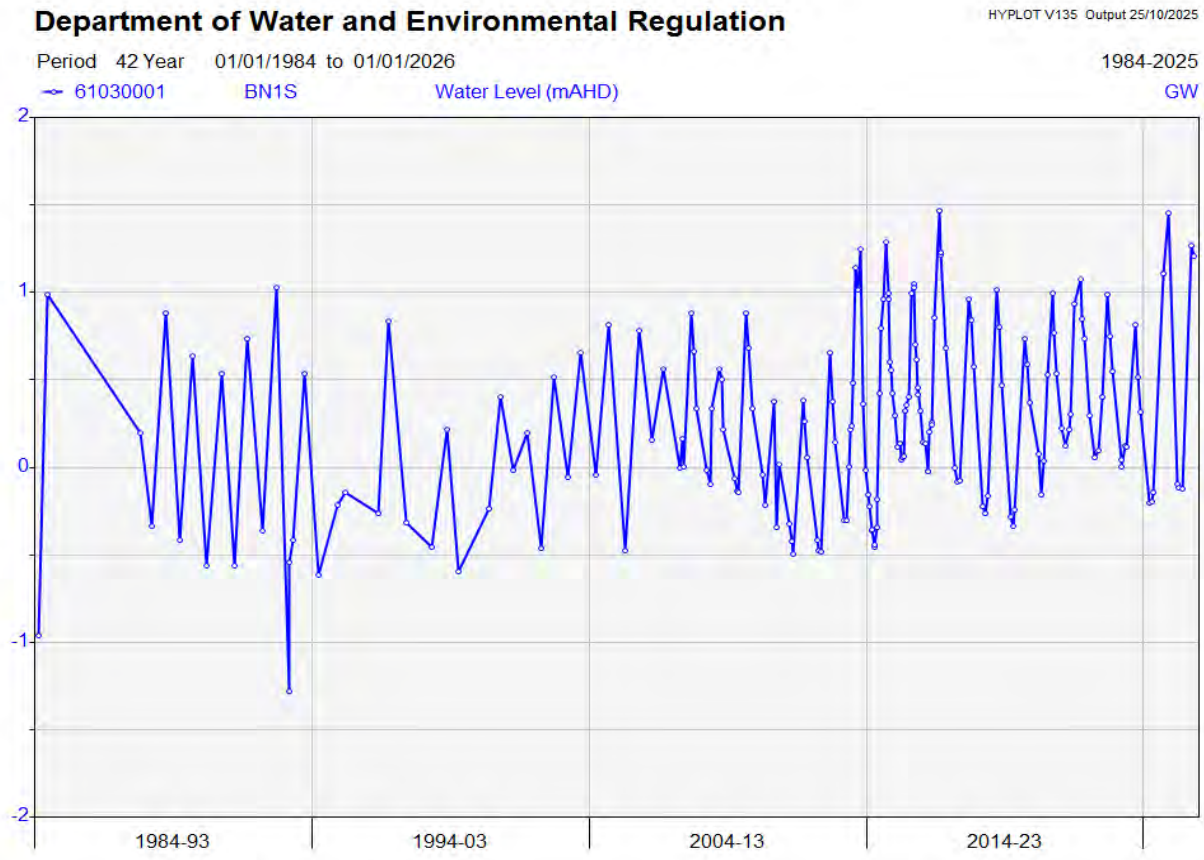
Date	Groundwater bTOC	Groundwater mAHD	Depth Below NS m
10/09/2024	0.73	1.87	
17/10/2024	1.32	1.28	
13/11/2024	1.54	1.06	
8/05/2025	2.32	0.28	
7/08/2025	0.60	2.00	
11/09/2025	0.61	1.99	
16/10/2025	0.86	1.74	
12/11/2025	1.05	1.55	

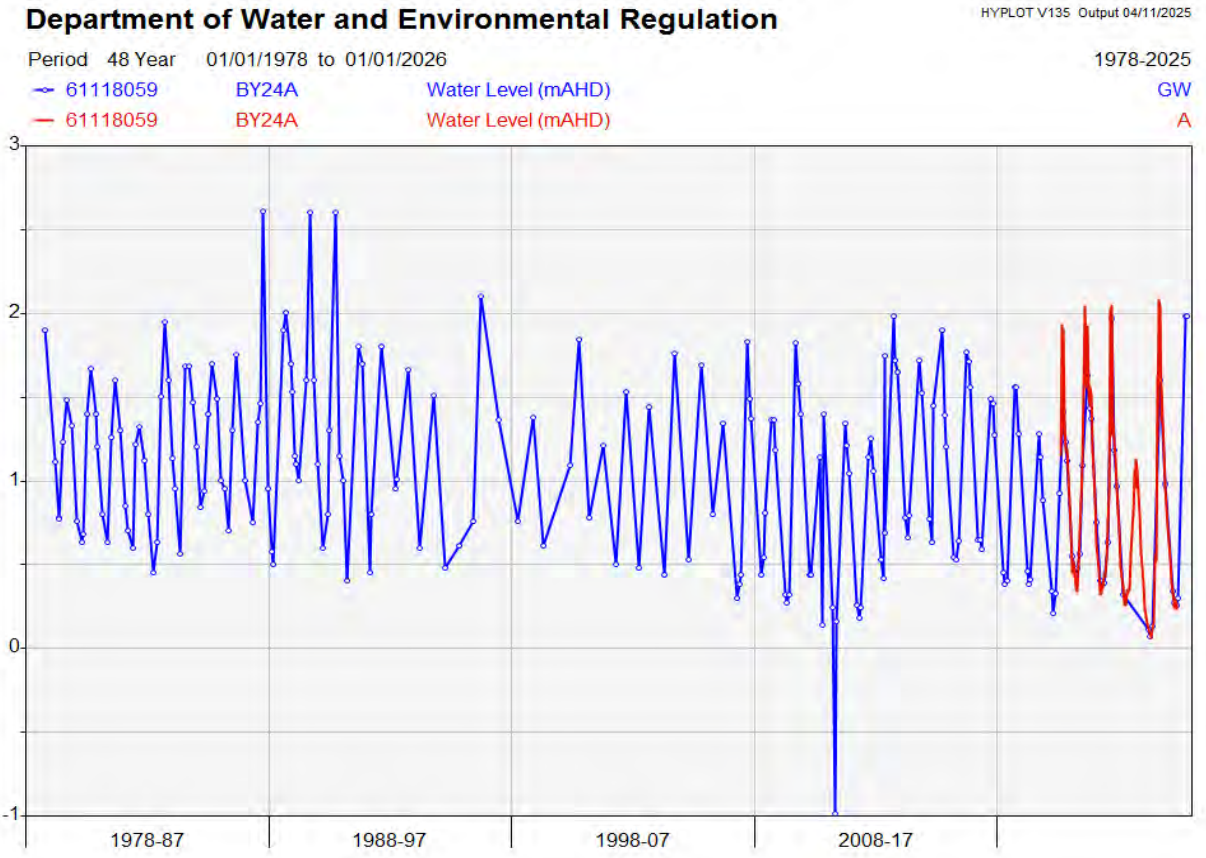
Minimum Recorded Level (mAHD)	0.28
Maximum Recorded Level (mAHD)	2.00

ATTACHMENT 3

DWER Long Term Hydrographs

Date : 19/11/2025 Job No H23080





APPENDIX E – NOISE MANAGEMENT PLAN

NOISE MANAGEMENT PLAN

LOTS 167 (No.365), 204, 205, 206 & 207 (No.363) MALLOKUP ROAD AND LOTS 159, 168 & 203 LUDLOW ROAD NORTH, STIRLING ESTATE

JUNE 2026

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Document Control

Version	Date	Author	Reviewer
V1	02/05/2026	NC	KMT
V2	14/05/2026	NC	KMT
V3	18/05/2026	NC	KMT
V4	22/06/2026	NC	KMT
Filename	2573_365 Mallokup Road NMP_v4		

Limitations

This report has been prepared by Accendo Australia Pty Ltd in accordance with the scope limitations provided in this report, or as otherwise agreed, between the Client and Accendo.

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.

This report has been prepared based upon data and other information provided by the Client and other individuals and organisations, most of which are referred to in the report, which Accendo has not independently verified or checked beyond the agreed scope of work. Accendo does not accept liability in connection with such unverified information.

The conclusions and recommendations in this report are based on assumptions made by Accendo described in this report where and as they are required. Accendo disclaims liability arising from any of the assumptions being incorrect.

The report is based on site specific conditions encountered and information received at the time of preparation of this report or the time that site investigations were undertaken. Accendo disclaims responsibility for any changes that may have occurred after this time.

The preparation of this report has been undertaken and performed in a professional manner, in consideration of the scope of services and in accordance with environmental consulting practices. No other warranty is made.

CONTENTS

TABLES

FIGURES

1 INTRODUCTION

1.1 Background

Dunkley Holdings Pty Ltd (the applicant) is proposing to extract sand and limestone from a 9.62 hectare (ha) area within Lots 167 (No. 365), 204, 205, 206 and 207 (No. 363) Mallokup Road and 159, 168 and 203 Ludlow Road North, Stirling Estate (herein referred to as the subject site) (refer to **Figure 1** and **2**).

The available volume of sand and limestone (*insitu* volume of approximately 300,000 m^3) is to be extracted, commencing in the northeast of the subject site moving in a south westerly direction (refer to **Appendix A**).

The post extraction landform will be designed with minimum batters of 1:6.

1.2 Purpose and Scope

This Noise Management Plan (NMP) has been prepared to fulfil the relevant requirements provided within the Shire of Capel's (the Shire) *Local Planning Scheme No.8* and the Shire's *Extractive Industries Policy 2.6.* It is intended to provide the Shire, the public and relevant government agencies with an understanding of the proposal and the environmental strategies and commitments proposed to address noise emissions associated with the proposed land use. This document has been prepared to support and should be read in conjunction with, the *Environmental Management Plan* prepared by Accendo Australia (2026) for sand and limestone extraction within the subject site.

The Plan will describe the proposed management measures necessary to ensure noise impacts on surrounding receptors will be managed in accordance with best practice and the *Environmental Protection (Noise) Regulations 1997*.

2 EXISTING ENVIRONMENT

2.1 Land Use

The subject site is zoned 'Priority Agriculture' pursuant to the Shire's *LPS No.* 8 and 'Rural' under the *Greater Bunbury Region Scheme (GBRS)*. The subject site has previously been used for agriculture.

Properties to the north and west are zoned 'Priority Agriculture' under *LPS No. 8* and 'Rural' under the *GBRS*. Beyond the properties to the west lies the Tuart Forest National Park, which also adjoins the subject site to the south and east and is zoned 'Public Open Space' under the *LPS No. 8* and 'Regional Open Space' and 'Rural' under the *GBRS*. Properties to the east are also zoned 'Priority Agriculture' under the *LPS No. 8*, and 'Regional Open Space' and 'Rural' under the *GBRS*.

2.2 Topography and Soils

The current topography of the subject site can be described as gently sloping with the elevation ranging from 5 metres (m) Australian Height Datum (AHD) in the southwest and centre to 1.5 m AHD in the north (refer to **Appendix A**).

The subject site is located within the Perth Coastal Zone within the Spearwood and Vasse Systems consisting of '*sand dunes and plains, yellow deep sands, pale deep sands and yellow/brown shallow sands*' and '*poorly drained estuarine flats, of the Swan Coastal Plain. Tidal flat soil, saline wet soil and pale deep sand*,' respectively (Natural Resource Information (NRInfo).

The subject site is located within the following sub-systems:

- Vasse Wonnerup wet flats phase- Poorly drained flats around the edge of the Vasse Estuary. Dark calcareous sands and mixed estuarine deposits; and
- Ludlow flats phase- Flats and very low dunes. Deep yellow brown siliceous sands over limestone (i.e. Spearwood Sands).

2.3 Climate

The climate of the locality is classified as Mediterranean with warm to hot dry summers and cool wet winters.

The closest weather recording station is Bunbury (Station 9965). Temperatures are highest on average in February, at approximately 30.2°C. July has the lowest average temperature of the year of 7.4°C.

Rainfall at the closest weather recording station Capel North (Station 9992), is approximately 673 mm per annum with approximately 90% of the rain falling during the winter months, April to October inclusive.

During the summer months the dominant wind in the mornings is from the south-east at 17-18 knots, swinging to the south-west at approximately 22 knots in the afternoon. During winter, the winds are most commonly 12-19 knots from no dominant prevailing direction. During storms, winds from the west and north-west can reach 40 knots (BoM 2020).

3 EXTRACTION ACTIVITIES

The sand and limestone quarry will cover an area of approximately 9.6 ha, with a current maximum elevation ranging from 5 m AHD to 1.5 m AHD. It will be excavated to an elevation of 1 m AHD commencing in the northeast of the subject site moving in a south westerly direction.

Extraction activities will be divided into five stages, each will be no greater than 2.0 ha in size (refer to **Appendix A**).

It is estimated that the total maximum volume of material to be removed will be approximately 300,000 m^3. Over a five year period, a maximum of approximately 60,000 m^3 will be excavated each year, depending on supply and demand.

Earthen bunds for noise mitigation will be constructed with topsoil and overburden that will be stripped from the extraction footprint and other areas on the northeastern boundary. Construction of the bunds will be undertaken with an excavator and loader.

The planned end use of the quarry is to restore a natural soil profile and return the extraction area to pasture, ensuring that there is no net loss of agricultural land.

3.1 Operational Works

Using a loader, the topsoil (where available) will be stripped and placed in stockpiles. Overburden, if present, will be removed using a dump truck and stockpiled to a convenient location within each extraction stage for operations.

In order to comply with noise regulations, the crusher may need to be positioned closer to the haulage route or a 3 m high bund (or shipping container) may need to be constructed adjacent to the crusher on the north western side of the subject site (SLR consulting 2026).

The material will be excavated by an excavator, bulldozer or loader to a stockpile or loaded directly to waiting trucks for transport. A summary of the proposed extraction activities is provided below:

- Excavation will commence in the northeast of the quarry moving in a south westerly direction, while maintaining a 10 m buffer from the dripline of the Tuart trees. The face and walls of the pit will act as noise barriers.
- Upon completion of each stage, the stage will be reformed and back filled using a combination of equipment such as a tracked bobcat, excavator and front-end loader, where subgrade material is available, to achieve the proposed final contours.
- At the end of excavation, the noise bunds will be removed, and the floor of the quarry will be deep ripped, covered by overburden and topsoil, and rehabilitated to a constructed soil.

3.1.1 Final Contours

The final surface contours of the quarry will be approximately 1 m AHD. Slopes of the batters at the end of excavation will be retained at 1:6 vertical to horizontal.

3.1.2 Rehabilitation

During operations, quarrying and rehabilitation of the extraction area will be undertaken progressively.

Upon completion of each stage, the following broad completion criteria will be achieved:

- A self-sustaining cover of pasture;

- Weed levels that are not likely to impact on the viability of the reconstructed soils; and
- A safe and stable landform suitable for the proposed future land use which will be productive, grazing pasturelands.

Rehabilitation is discussed in further detail in the *Rehabilitation Management Plan* prepared by Accendo Australia (2026).

3.2 Proposed Operating Times

Typical operating hours for quarries will be adopted for the subject site which involves 7am to 6pm each Monday to Friday and Saturdays 7am to 12pm, excluding public holidays.

3.3 Equipment

All operational equipment will work on the quarry floor to provide maximum sound and visual screening. All equipment and infrastructure will be fully portable to facilitate movement throughout the site required for staged quarrying operations. The site will be secured by locked gates when it is not being actively worked. The boundary fencing will be maintained to prevent inadvertent and unauthorised entry.

Equipment and facilities that may be used onsite are provided in the Table below.

Table 1. Equipment.

Equipment	Description
Site office and/or containers	May be required for the management and security of small items.
Toilet	A portable toilet may be required on site.
Watercart	Used for dust suppression on the access roads and working floors when required.
Bulldozer	Topsoil will be stripped using a bulldozer. Bulldozers will also be used for the movement of material and loading trucks.
Front End Loader	Loaders will be used for the movement of material and loading road trucks.
Excavator	An excavator may be used for the removal of material.
Mobile crushing and screening plant	Mobile crushing and screening plant (licensed by DWER) will be utilised for the processing of material. Mobile screening and crushing plants are to be used for the preparation of various grades of sand and limestone.
Fuel storage	No fuel will be stored onsite.
Light vehicles	Access to and around the site.
Truck	Transport of sand and limestone to crusher and removal of sand and limestone from site.

4 NOISE IMPACTS AND MANAGEMENT

4.1 Sensitive Receptors

The subject site has been designed to maximise setbacks to the closest sensitive receptors. This has involved extensive analysis of the local landform, environmental characteristics, land uses and location of sensitive receptors. Consultation with all sensitive receptors has also been undertaken by the Proponent.

The Environmental Protection Authority's (EPA) *Guidance for the Assessment of Environmental Factors* (June 2005) provides generic separation distances to assist in the determination of suitable buffers where industry may have the potential to affect the amenity of a sensitive land use. In particular, for extractive industries, a buffer distance of 300 m to 500 m is recommended from sensitive land uses. A conservative buffer of 500 m to sensitive receptors has been adopted for this proposal given that onsite screening and crushing is proposed.

The closest residential dwellings to the subject site are provided below and shown in **Figure 3.**

Table 2. Residential dwellings within 1500 m of the subject site

Address	Distance to subject site (m)
Lot 202 Ludlow North Road	162
Lot 202 Ludlow North Road	254
Housing Estate	260
Lot 51 Ludlow North Road	263
Lot 201 Ludlow North Road	395
Lot 50 Mallokup Road (Chalet accommodation)	540
Lot 52 Mallokup Road	680
Lot 123 Mallokup Road	991
228 Mallokup Road	1241

The closest residential dwelling to the subject site is located approximately 162 m to the northwest. A housing estate consisting of 11 houses is located approximately 260 m from the subject site. Additionally, a short stay accommodation business is located approximately 540 m to the north of the subject site.

4.2 Noise Generating Activities

The project works will involve the use of machinery and equipment that will generate noise during operation. Sources of noise from the subject site will include:

- Machinery noise from equipment use.
- Noise from safety equipment (beepers on machinery).
- Noise from trucks departing the site.

Reversing alarms can represent significant nuisance noise to sensitive receptors. There are a number of alternatives to alarms that maintain a safe work environment and also comply with occupational health and safety legislation. Reversing alarms alert pedestrians when a vehicle is moving, however, given that no pedestrians will be onsite (private property), the applicant has committed to using flashing lights or a broadband alarm system as an alternative. The sound of a broadband alarm is much less intrusive by nature than the sound of a tonal alarm and tends to be masked by the background noise at a lesser distance. This will eliminate/reduce noise emissions associated with reversing alarms.

Extraction activities will only be undertaken during standard hours of operation (in accordance with the conditions of the Extractive Industry Licence). A summary of potential noise generating activities is presented in **Table 3**.

Table 3. Noise generating activities.

Activity	Duration	Equipment to be used	Sound pressure Level (dB(A))	Comments
Topsoil stripping	3 weeks per year	Bulldozer	114	Initial impact to closest resident which will reduce as stockpiles increase.
		Loader	110	Initial impact to closest resident which will reduce as stockpiles increase.
Screening and stockpiling of sand	6 weeks per year	Loader	110	Noise will be muffled by stockpiles and site topography
		Screener	110	Noise will be muffled by stockpiles
		Crusher	114	Noise will be muffled by stockpiles
		Excavator	108	Noise will be muffled by stockpiles
Crushing and stockpiling of limestone	6 weeks per year	Crusher	114	Noise will be muffled by noise bunds
		Excavator	108	Noise will be muffled by noise bunds
Truck movement	Dependent on demand.	Trucks	111	Noise will be muffled by stockpiles, vehicles are new and well maintained.
Rehabilitation of completed stages	To be undertaken in conjunction with excavation works where applicable.	Loader	111	Limited period of moderate noise levels, indistinguishable from excavation noise when undertaken concurrently.

Noise levels have been obtained from the *Environmental Noise Assessment* (SLR Consulting 2026) prepared for 365 Mallokup Road, Stirling Estate for the extraction of sand and limestone.

The *Environmental Noise Assessment* by SLR Consulting (2026) indicates that, across five assessed operational scenarios, predicted noise levels at the Receiver R-4 marginally exceed the assigned level (refer to **Appendix B**). Although this exceedance is minor, it is noted that there are many practicable mitigation options if required. These options would include but are not limited to;

- Repositioning the crusher approximately 15 m to the east, closer to the haulage route, (Refer to **Figure 8** of **Appendix B**); or

- Constructing a 3 m high bund or placing a shipping container adjacent to the crusher such that it screens noise from the crusher in the direction of the nearest noise sensitive receivers.

Provided the recommended noise mitigation measures are implemented, it is concluded that compliance with the applicable assigned noise level can be achieved at all noise sensitive receptors during the specified working hours.

4.3 Noise Management Measures

The proponent will ensure that noise emissions comply with the requirements of the *Environmental Protection (Noise) Regulations 1997* at all times. In addition, the management measures prescribed within **Table 4** will be implemented to reduce noise emissions as far as practicable.

Table 4. Management actions for noise.

Item	Action	Trigger/Timing	Responsibility
Inductions			
1	As part of site inductions, employees, contractors and visitors to the site are reminded of their responsibility to undertake work activities in an environmentally sensitive manner, including minimising noise while on site, or entering and leaving the site.	Ongoing	Site Manager
Planning Controls			
2	Daily Planning • The use of significant noise generating equipment or activities simultaneously is avoided. • The noisiest activities are scheduled to the least sensitive times of the day.	Where possible	Site Manager
3	Regular review of meteorological data, specifically wind speed and direction, to guide decisions on quarrying activities.	As required, with consideration to the intensity of activities onsite and the prevailing weather conditions	Site Manager
Operational Controls			
4	Equipment and Machinery • Use machinery and equipment with minimal noise output levels. • Ensure all machinery is regularly serviced as per the equipment's maintenance schedule to minimise noise generation. • Where appropriate, all machinery and equipment will be shut off when not in use. • Use flashing lights/broadband alarms instead of tonal reversing alarms on excavators/loaders. • Apply speed restrictions (20 km/hr within site) and a ban on exhaust braking.	Continuous	All employees & contractors
5	Earth bunds • Overburden and topsoil will be used to form perimeter bunds to assist with noise screening. • Earth bunds around the plant, as specified within either Figure F or Figure G of **Appendix B** will be constructed to reduce noise impacts to nearby residents.	Prior to quarrying	Site Manager

Item	Action	Trigger/Timing	Responsibility
Inductions			
Complaints Management			
6	Erect on-site signage directing public to make complaints to the relevant person.	Prior to quarrying	Site Manager
7	Maintain a complaints register (refer to **Appendix C**). A Complaints Register will be established for the site to record the following information: • Date, time, location and nature of the exceedance. • Identify the cause (or likely cause) of the exceedance and responsible parties. • Identify the activities that were occurring at the time of the non-compliance. • Determine the activities that were most likely contributing to the non-compliance. • Describe what action has been taken to date. • Describe the proposed measures to address the exceedance. If the complaint is verified as being due to a site source, remedial action will be undertaken within 2 hours. The Shire of Capel will be advised of all complaints as soon as they are received. If a compliant cannot be resolved within the 2 hour response period, it may be necessary to cease operations.	Upon receiving complaint	Site Manager

REFERENCES

Department of Parks and Wildlife (DBCA) (2004). *Geomorphic Wetlands of the Swan Coastal Plain dataset*.

Environmental Protection Authority (EPA) (2006). *Guidance Statement No.10 for the Assessment of Environmental Factors (in accordance with the EP Act 1986: Levels of Assessment for Proposals Affecting Natural Areas Within the System 6 Region and Swan Coastal Plain Portion of the System 1 Region.*

Environmental Protection Authority (EPA) (2009). *South West Regional Ecological Linkages.* Bulletin No 8. Retrieved from: http://epa.wa.gov.au/EPADocLib/3040_SWREL_EPB821009.pdf

Semeniuk, C. A. & Semeniuk, V. (1995). *A geomorphic approach to global classification for inland wetlands*. Vegetation, 118, 103-124.

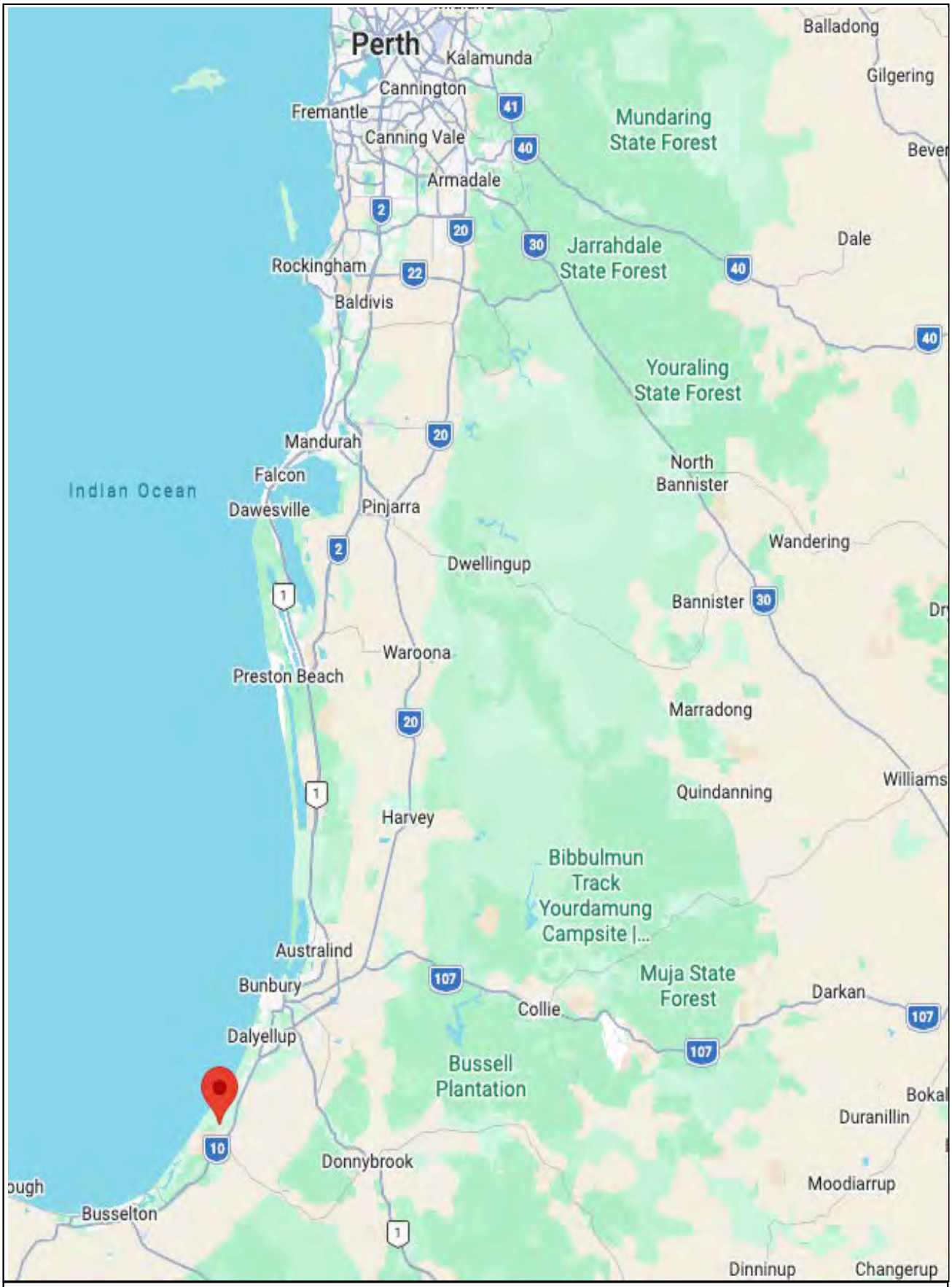
Harewood (2025) *Fauna Assessment 365 Mallokup Road, Stirling Estate Capel*, unpublished, Bunbury WA.

Plantecology Consulting (2025) *Stirling Estate Tuart Woodland Survey*, unpublished, Kinglsey, WA

SLR Consulting (2026) *Sand Extractive Industry Stirling Estate, Environmental Noise Assessment*, Subiaco, WA

Western Australian Planning Commission (WAPC) (2007). *Planning Bulletin No. 64: Acid Sulfate Soils*, Western Australian Planning Commission, Western Australia.

FIGURES



PROJECT	365 Mallokup Road,Stirling Estate
DRAWING TITLE	Figure 1 – Site Locality
CLIENT	Dunkley Holdings Pty Ltd

Project Number	Drawing Number	Revision
2573	Figure 1	A

Designed NC
Drawn PN
Checked
Approved

Date 08/04/2026
Local Authority Shire of Capel
Sheet 1 of 1

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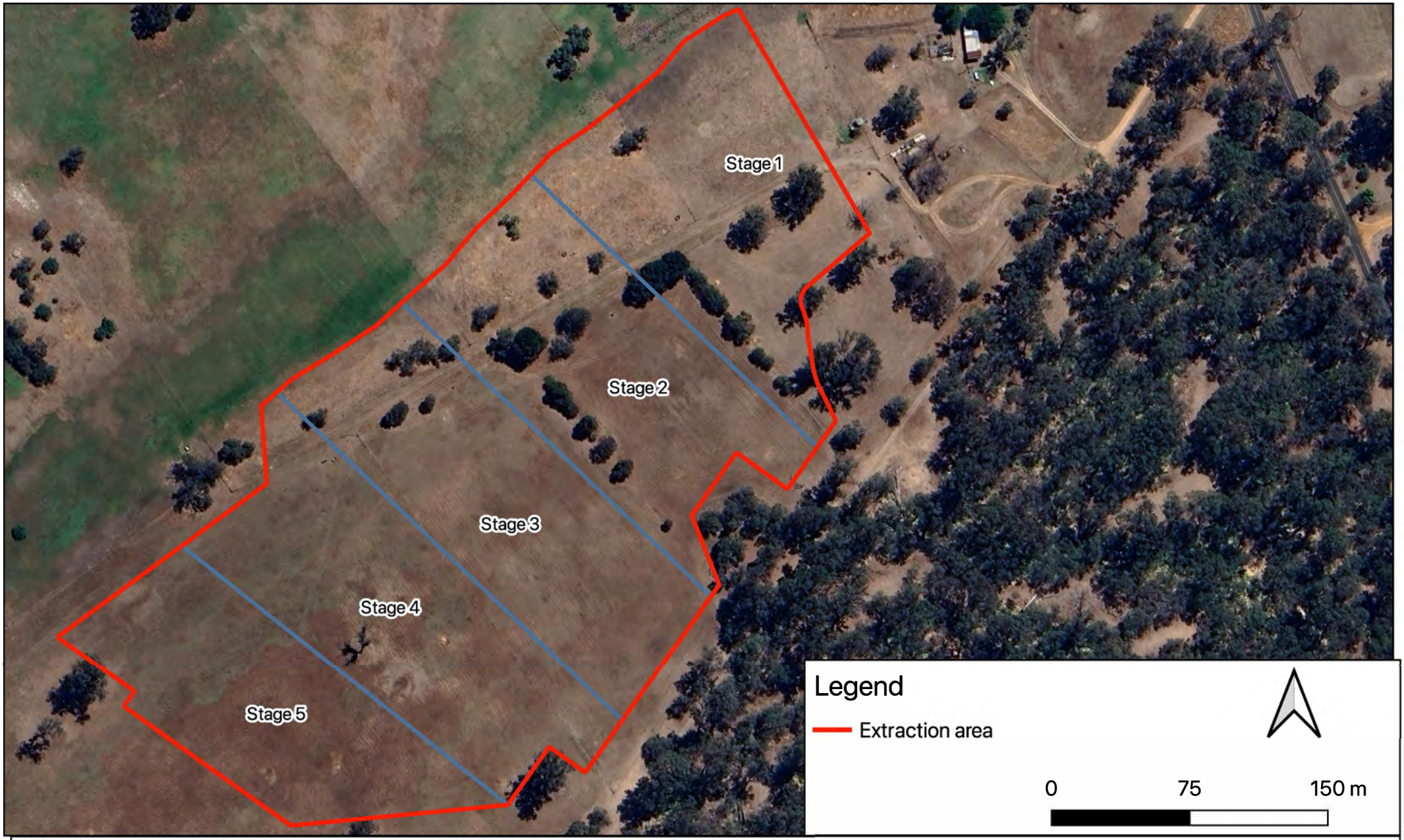

PROJECT	365 Mallokup Road, Stirling Estate
DRAWING TITLE	Figure 2- Site Extent
CLIENT	Dunkley Holdings Pty Ltd

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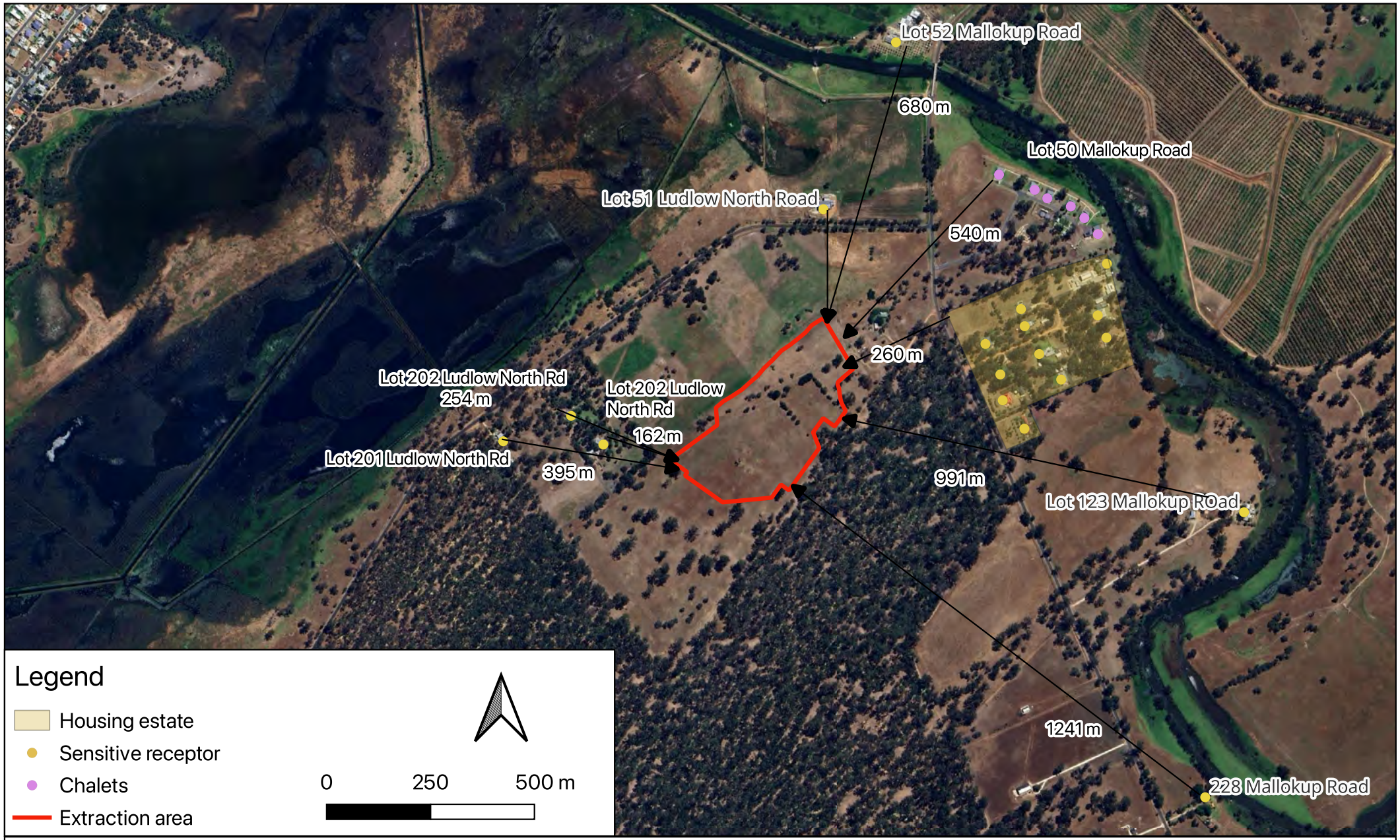
Western Australia 6280
Mobile 0418 950 852

Project Number	2573	Designed	NC
Drawing Number	Figure 2	Drawn	PN
Revision	A	Checked	
Date	05/05/2026	Approved	
Sheet 1 of 1		Local Authority	Shire of Capel



PROJECT	365 Mallokup Road, Stirling Estate
DRAWING TITLE	Figure 3- Sensitive Receptors
CLIENT	Dunkely Holdings Pty Ltd

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Western Australia 6280
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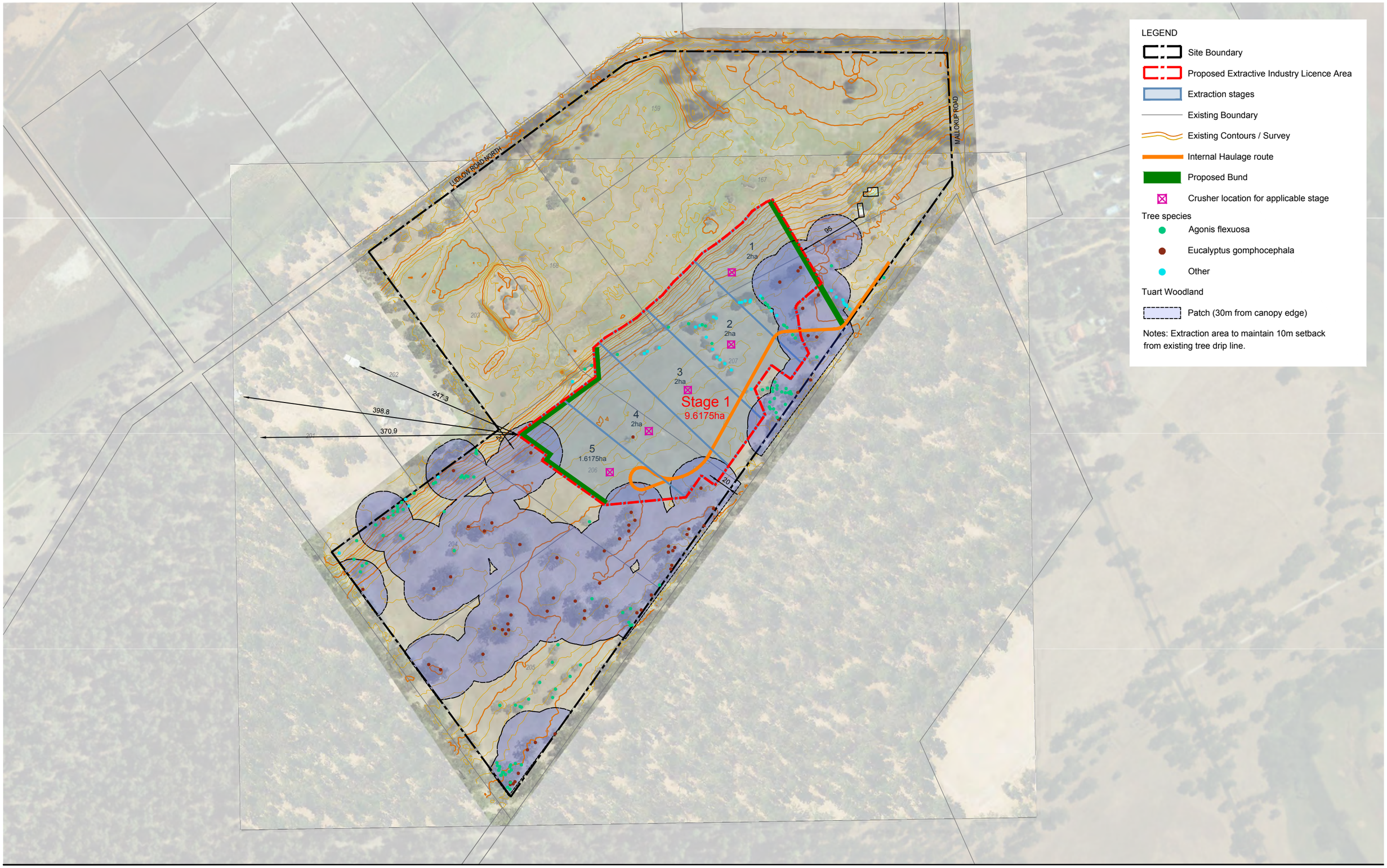
Project Number	2573	Designed	NC
Drawing Number	Figure 3	Drawn	PN
Revision	A	Checked	
Date	18/05/2026	Approved	
Sheet 1 of 1		Local Authority	Shire of Capel

APPENDIX A – EXCAVATION WORKS PLAN



Excavation Works Plan

Mallokup Road, Stirling Estate

0 100m

Date: 26 May 2026 Scale: 1:5000 @ A3 1:10,000 @ A1 File: **23-434 EX01A** Staff: HK JJ Checked: DL

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APPENDIX B – ACOUSTIC ASSESSMENT

Sand Extractive Industry – Stirling Estate

Environmental Noise Assessment

Dunkley Holdings Pty Ltd

286 Mallokup Rd
Stirling Estate WA 6271

Prepared by:

SLR Consulting Australia

Level 1, 500 Hay Street, Subiaco WA 6008,
Australia

Report Number 675.073459.00001

18 June 2026

Revision: 2

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
2	18 June 2026	Secil Kosu	Luke Zoontjens	Luke Zoontjens
1	24 March 2026	Secil Kosu	Luke Zoontjens	Luke Zoontjens
0	3 December 2025	Secil Kosu	Luke Zoontjens	Luke Zoontjens

Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Dunkley Holdings Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

Executive Summary

SLR Consulting Australia Pty Ltd (SLR) has undertaken an environmental noise assessment to evaluate the potential noise emissions associated with proposed sand extraction operations at Mallokup Road, Stirling Estate. The assessment has been completed to determine compliance with the *Environmental Protection (Noise) Regulations 1997* (the 'Regulations').

Five worst-case operational scenarios (Scenarios 1 to 5), representing the progression of the extraction works across Areas 1 to 5 of the site, were modelled under a flat terrain assumption. In each scenario, operational activities involving the truck, bulldozer, crusher, screen, loader, watercart and excavator were simulated within the respective extraction area to assess noise levels at the nearest receivers

Noise levels were predicted at four residential receivers located near the site, accounting for the time-varying nature of moving environmental noise sources in accordance with published DWER guidelines.

In terms of results,

- Under Scenario 1 and the large majority of operations, noise emissions are predicted to comply with the assigned noise level limits at both receivers.
- Under Scenario 2 and the large majority of operations, noise emissions are predicted to comply with the assigned noise level limits at both receivers.
- Under Scenario 3 and the large majority of operations, noise emissions are predicted to comply with the assigned noise level limits at both receivers.
- Under Scenario 4 and the large majority of operations, noise emissions are predicted to comply with the assigned noise level limits at both receivers.
- For Scenario 5, noise emissions are predicted to generally comply at all receivers; however, at receiver R-4, the predicted noise level is marginal, being within 1 dB of the assigned L_{A10} limit.

The 1 dB difference at R-4 falls within the typical variability of site operations and modelling and is practicably manageable. Compliance can be achieved by repositioning the crusher approximately 15 m to the east, closer to the haulage route, or by constructing a 3 m high bund (or shipping container) adjacent to the crusher on the side facing the receiver.

Overall, the assessment indicates that the proposed sand extraction activities **can practicably comply** with the Regulations.

Table of Contents

1.0 Introduction

SLR Consulting Australia Pty Ltd (SLR Consulting) has been commissioned by Element on behalf of Dunkley Holdings Pty Ltd to undertake an assessment of sand extraction activities proposed at Mallokup Road, Stirling Estate .

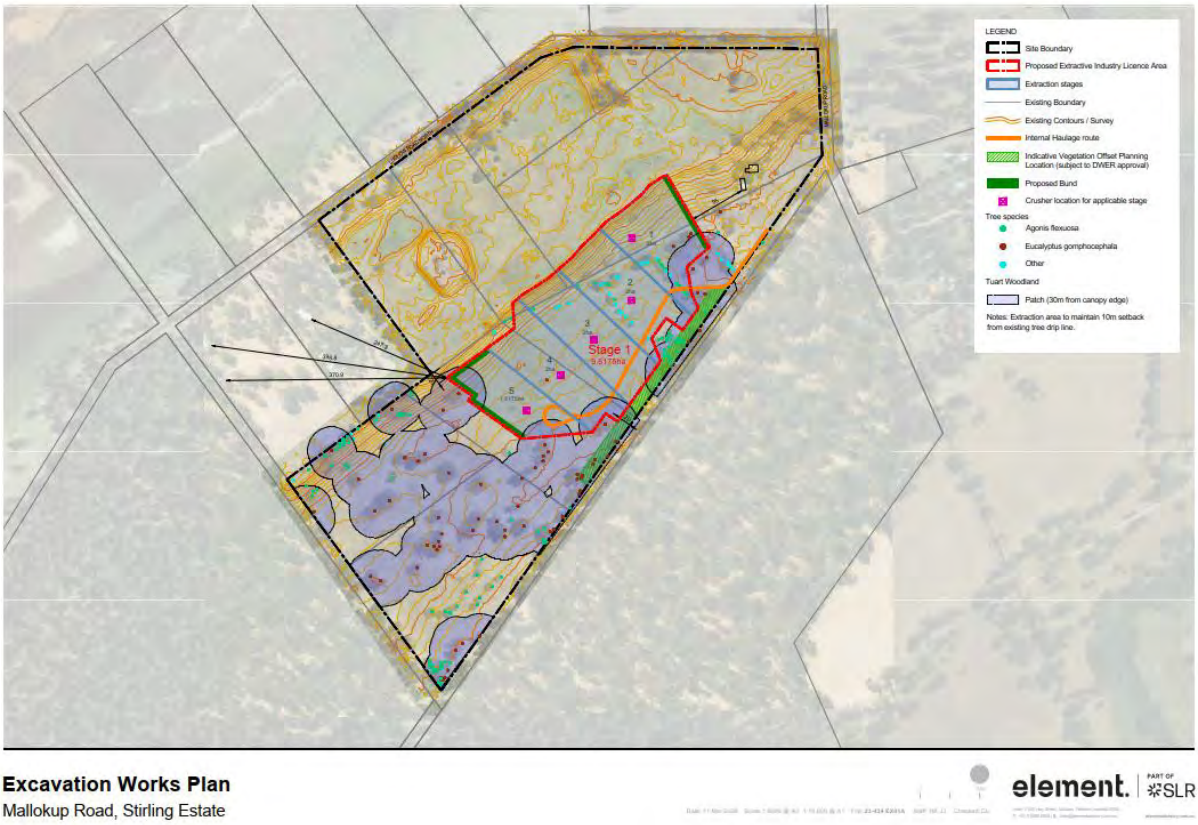
The proposed extraction operations will operate from 7am to 6pm Monday to Friday and from 7am to 12pm on Saturdays. No operations would occur on Sundays or Public Holidays.

The project site is shown in **Figure 1**. We understand that extraction operations are proposed on this site using a front-end a loader, an excavator, a bulldozer, a watercart, a limestone crusher, screen and trucks. The nearest residential premise is located 70 meters to the northeast of the proposed extraction.

This report documents the predicted noise emissions associated with operation of the proposed facility.

A glossary of terminology is provided in **Appendix A** to assist the interpretation of this report.

Figure 1: Locality of the Project - Overview



2.0 Criteria

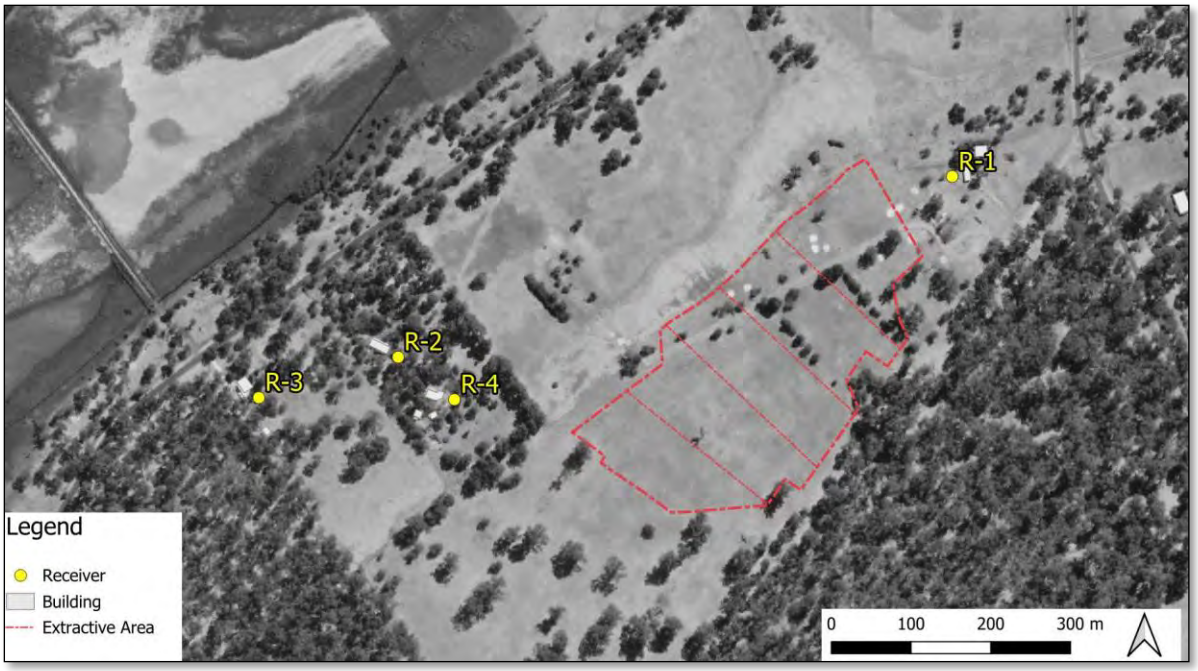
For industrial premises, site noise emissions are required to meet **the Regulations**. Under **the Regulations**, noise levels at nearby residential areas from extraction operations are not to exceed defined limits ("Assigned Levels"). For the nearest noise sensitive receptor, the 'Assigned Levels' are described in **Table A**.

Table A: Assigned noise level summary

Part of premises receiver noise	Time of day	Assigned Noise Level, dB		
		L_{A10}	L_{A1}	L_{Amax}
Noise Sensitive premises at locations within 15 m of a building directly associated with a noise sensitive use	7.00 am to 7.00 pm Monday to Saturday ('Day')	45 + IF	55 + IF	65 + IF
	9.00 am to 7.00 pm Sunday and public holidays ('Sundays')	40 + IF	50 + IF	65 + IF
	7.00 pm to 10.00 pm all days ('Evening')	40 + IF	50 + IF	55 + IF
	10.00 pm on any day to 7.00 am Monday to Saturday and 9.00 am Sunday and public holidays ('Night')	35 + IF	45 + IF	55 + IF

The noise sensitive receivers are presented in **Figure 2**.

Figure 2 Noise sensitive receivers



At the R-1 receiver location, the inner circle(100m) falls entirely within the project area and therefore comprises 100% industrial premises. The outer circle(450m) comprises 55% industrial premises.

At the R-2 receiver location, the outer circle comprises 40% industrial premises, while the inner circle comprises 2% industrial premises.

At the R-3 receiver location, the outer circle comprises 18% industrial premises.

At the R-4 receiver location, the outer circle comprises 50% industrial premises, while the inner circle comprises 10% industrial premises

The relevant assigned levels are therefore summarised in **Table B**.

Table B Sensitive receptors and Assigned Levels

Locality	Influencing Factor, dB	L_{A10}, dB	L_{A1}, dB	L_{Amax}, dB
R-1 (363 Mallokup Rd.)	16	61	71	81
R-2 (1092/1 Ludlow Rd.)	4	49	59	69
R-3 (1034 Ludlow Rd.)	2	47	57	67
R-4 (1092/2 Ludlow Rd.)	6	51	61	71

Table C summarises applicable adjustments for intrusive or annoying characteristics. No intrusive characteristics are assumed on the basis that the method of sand extraction and transfer to the truck can be reasonably undertaken without leading to these characteristics being present at the point of noise reception.

Table C Adjustment for Intrusive Noise Characteristics

Noise characteristic	Definition	Adjustment if present (Note[1])
Tones	Where the difference between the A weighted sound pressure level in any one third octave band and the arithmetic average of the A weighted sound pressure levels in the two adjacent one third octave bands is greater than 3 dB in terms of $L_{Aeq,T}$ where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as L_{ASlow} levels.	+5 dB
Modulation	A variation in the emission of noise that – • Is more than 3 dB L_{AFast} or is more than 3 dB L_{AFast} in any one third octave band; • Is present for at least 10% of the representative assessment period; and, • Is regular, cyclic and audible.	+5 dB
Impulsiveness	Present where the difference between the L_{APeak} and L_{Amax} is more than 15 dB when determined for single representative event.	+10 dB

Note 1 where noise emission is not music, these adjustments are cumulative to a maximum of 15 dB.

3.0 Methodology

3.1 Scenarios

As the nearest noise-sensitive receivers are located at the north-eastern and north-western extents of the extraction area, a series of scenarios have been developed to represent the worst-case conditions of the proposed sand extraction activities across the site.

In all scenarios, the limestone crusher and screen have been modelled as a fixed point source located at the positions shown in **Figure 1**. Mobile plant, including the dozer, excavator, loader, watercart and trucks, have been modelled to operate around the crusher, representing typical operational movement within each extraction area.

- Scenario 1 – Operations are modelled within Area 1 (2ha)
- Scenario 2 – Operations are modelled within Area 2 (2ha)
- Scenario 3 – Operations are modelled within Area 3 (2ha)
- Scenario 4 – Operations are modelled within Area 4 (2ha)
- Scenario 5 – Operations are modelled within Area 5 (1.6ha)

The loader and bulldozer have been modelled as moving sources, representing their full operational movement within the extraction area. The trucks and watercart have been modelled as moving sources operating continuously along the haulage route between the screen and the site entrance. The excavator has been modelled as a fixed-point source operating at a single location. The change in noise level over time has been directly modelled by accounting for the duration each noise source spends at each position, allowing the results to be directly compared with the assigned noise levels.

The following bunding configurations have been included in the model as part of the assessment:

- Scenario 1: 2m bund at the north-eastern boundary
- Scenario 2: No bunding
- Scenario 3: 2m bund at the north-western boundary
- Scenario 4: 3.5m bund along the northern and western boundaries
- Scenario 5: 3.5m bund along the northern and western boundaries

The scenarios and bunds are presented in **Figure 3**, **Figure 4, Figure 5, Figure 6** and **Figure 7.**

Figure 3 Sources in Scenario 1

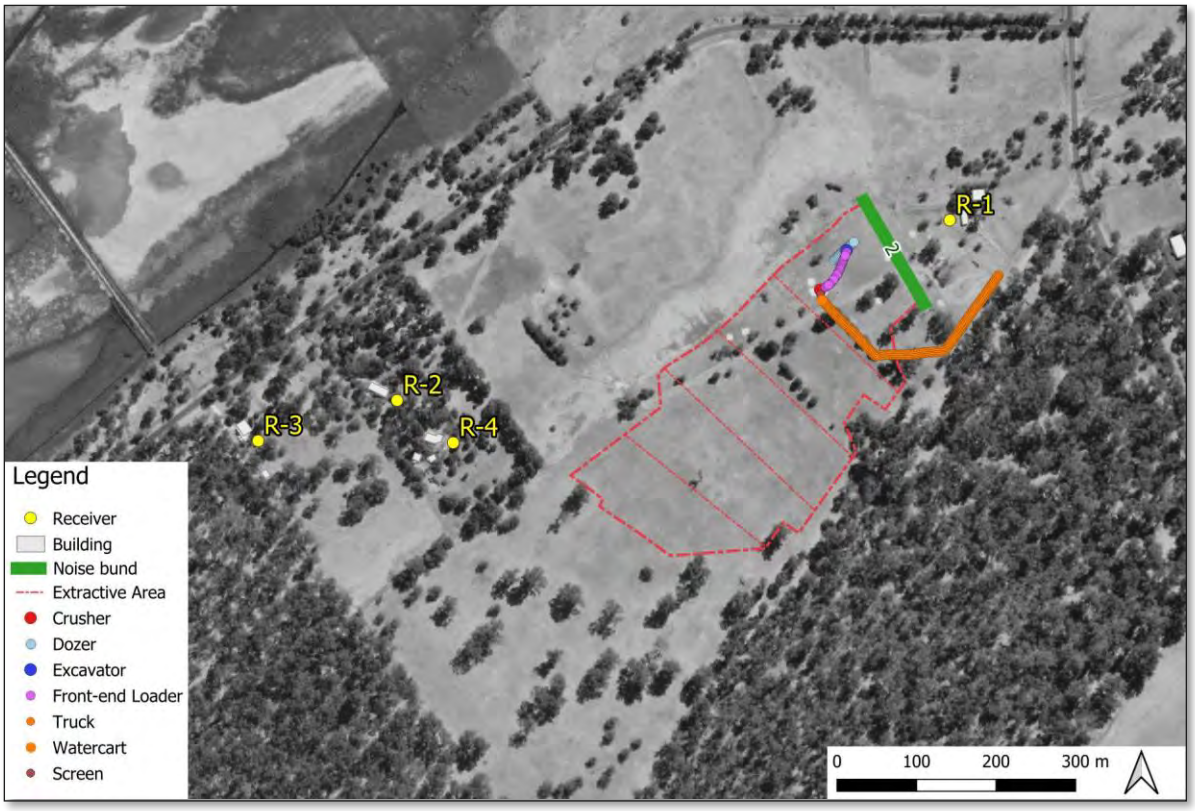


Figure 4 Sources in Scenario 2

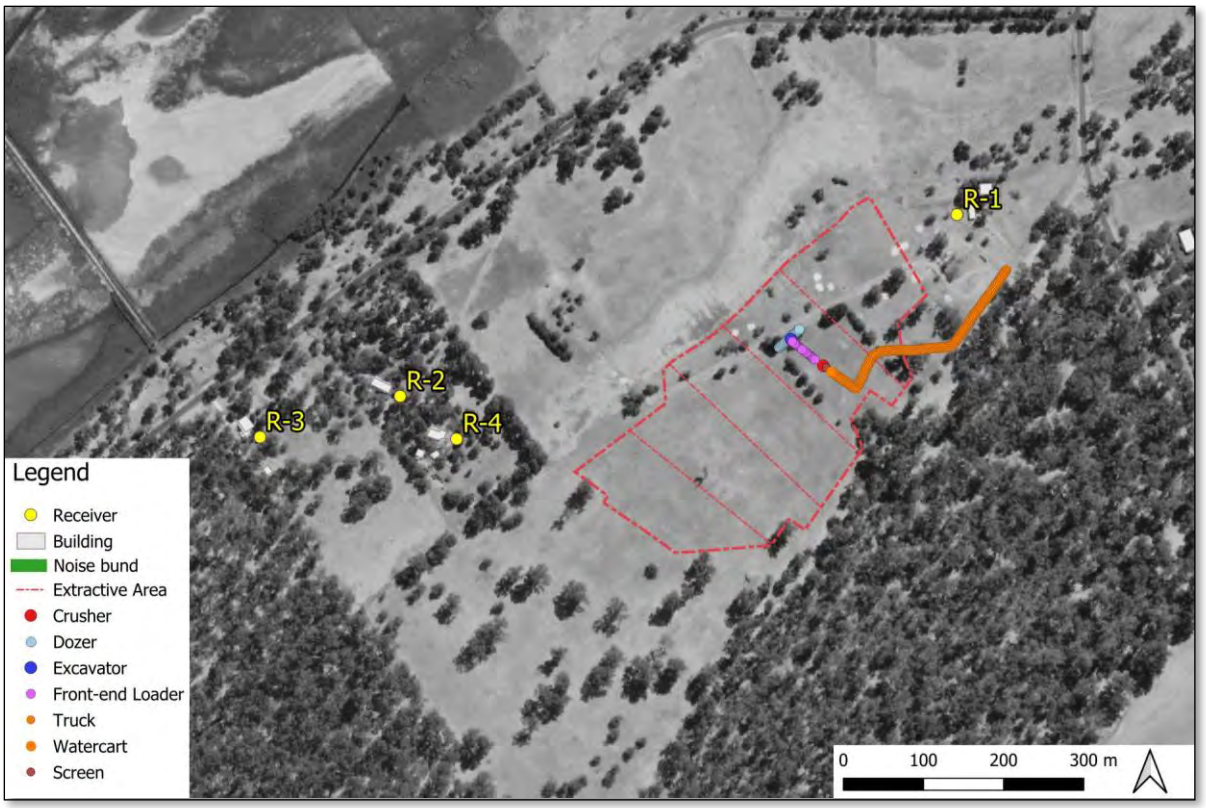


Figure 5 Sources in Scenario 3

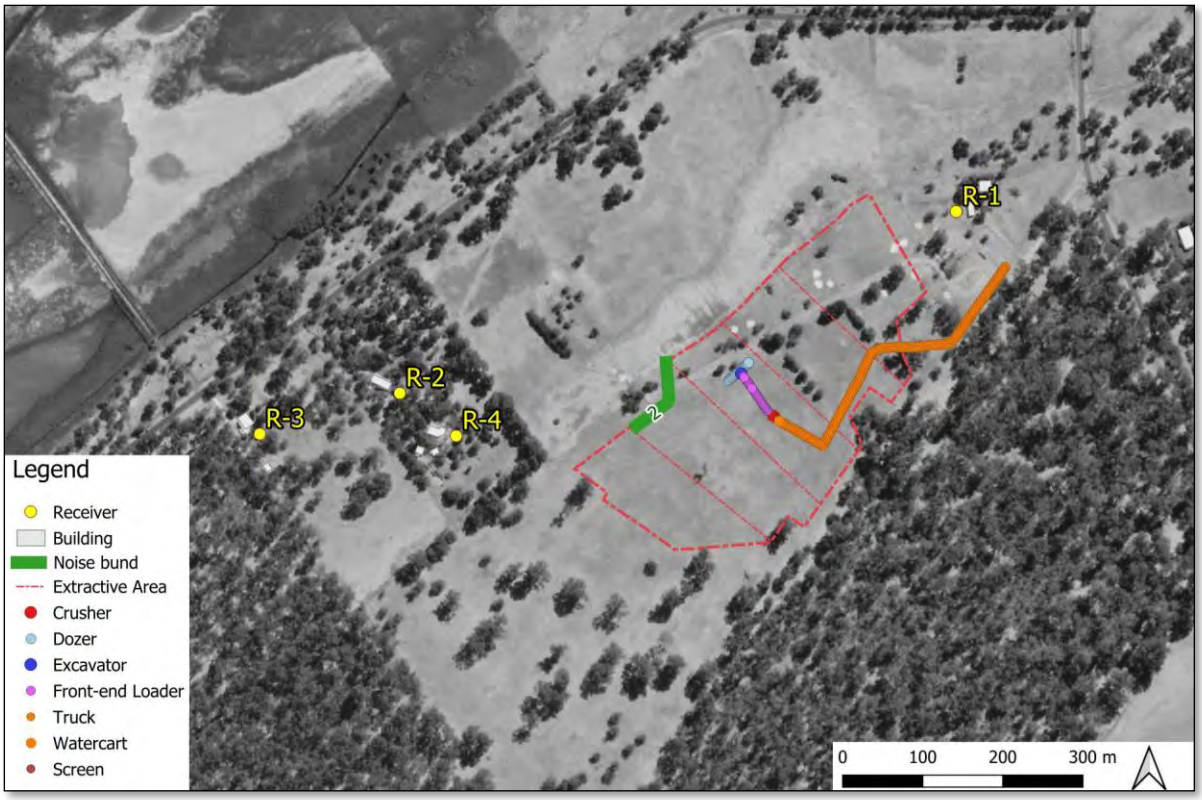


Figure 6 Sources in Scenario 4

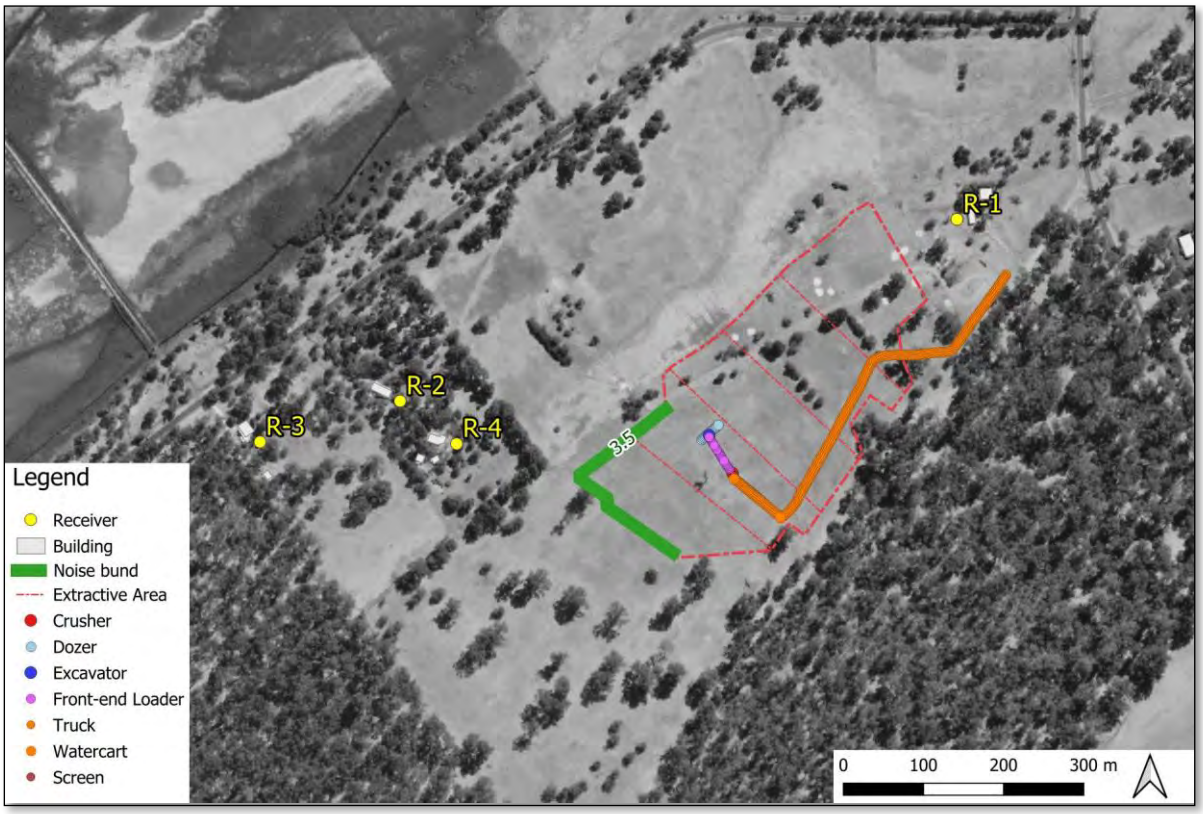
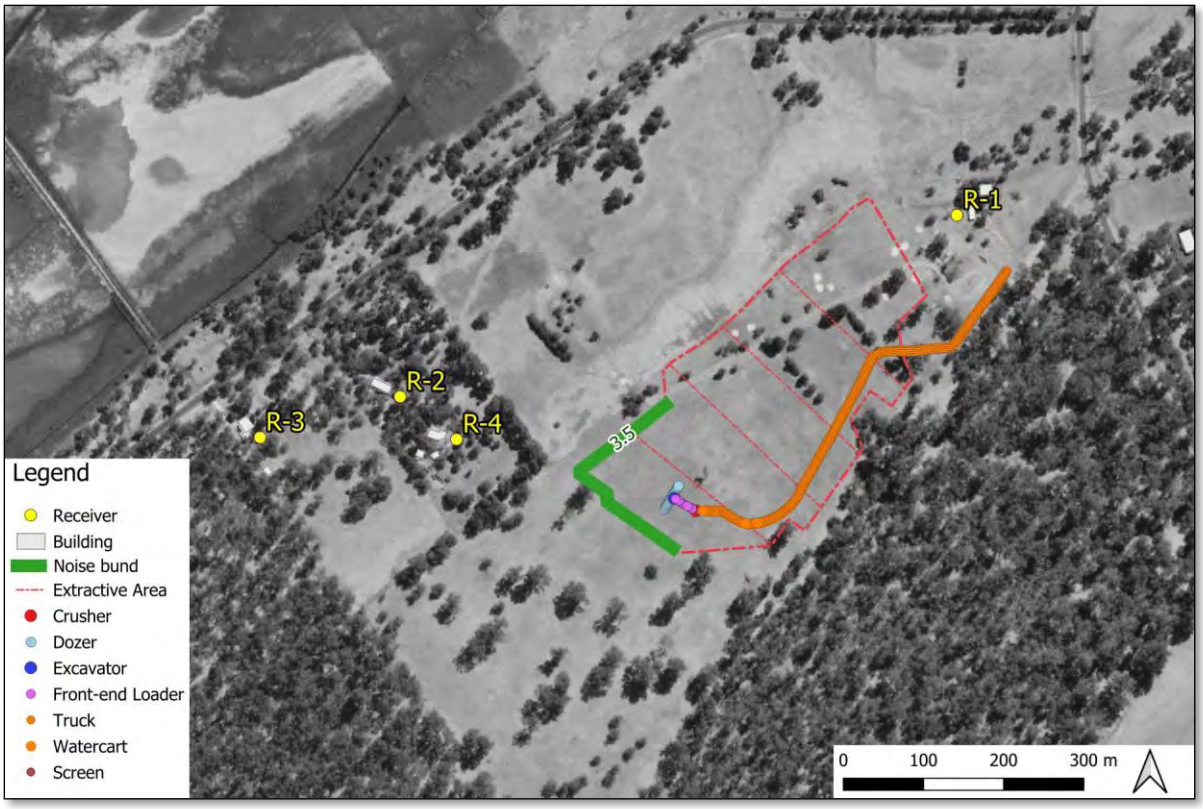


Figure 7 Sources in Scenario 5



The following methodology was applied in both scenarios to assess the predicted noise impacts:

- The sound power levels for the loader, crusher, screen, excavator, watercart, bulldozer and truck were obtained from BS 5228[1] standard data, as presented in **Table D**;
- Noise emissions from the site were modelled utilising sound propagation software SoundPLAN (Version 9.1). The noise model accounts for the effects of terrain, buildings and structures;
- The model implements ISO 9613-2:2024. The method accounts for atmospheric absorption, ground effects and screening from terrain and buildings;
- A receptor was placed at the nearest outdoor positions representative of each noise sensitive receiver;
- The time-varying noise levels at these locations were predicted using the model over a minimum time period of 15 minutes. In accordance with **the Regulations**, it was assumed that during the 15-minute assessment period, trucks and the watercart operate along the haulage route and undertake loading activities, while the loader, bulldozer, limestone crusher and screen operate continuously. The noise levels exceeded for 10% of the 900-second assessment period were assessed as L_{A10}; and
- The predicted noise levels from both scenarios were assessed against the relevant assessment criteria.

[1] BS 5228-1:2009+A1:2014 : Code of practice for noise and vibration control on construction and open sites - Part 1 : Noise

3.2 Source levels

Table D Modelled sound power level of key equipment, dB re 1 pW

Source	Height (m)	L_{wA} (dB)	Full octave band centre frequency, Hz							
			63	125	250	500	1k	2k	4k	8k
Truck- Movement	1.0	111	115	113	111	109	106	102	99	94
Loader- Movement	1.0	110	120	112	111	105	104	102	99	90
Limestone Crusher	2.0	114	119	116	114	111	108	105	103	98
Screen	1.5	110	120	112	111	105	104	102	99	90
Excavator Movement	1.0	108	110	115	110	105	100	98	94	87
Watercart Movement	0.8	104	108	109	103	107	101	102	98	93
Bulldozer Movement	1.0	114	107	115	107	106	110	108	100	94

The activity involves sand being separated from the surface by an excavator, collected by the loader, and then loaded into trucks for transport to the crusher and screen, where the material is processed and separated. A bulldozer operates within the extraction area to level and prepare the working surface, while a watercart is used for dust suppression across internal roads and active work areas. These operations do not generate distinct impulsive noise. Therefore, no impulsive adjustment has been applied in the assessment.

3.3 Uncertainty of prediction

The expected level of system prediction uncertainty as estimated according to the ISO Guide to Measurement Uncertainty is outlined in **Table 5**.

Table 5 Estimated prediction uncertainty by system

Parameter	System	U_{95} (Note [1])	Student's t-factor
Airborne noise L_{Aeq}, L_{A10}, L_{A1}	ISO 9613	3.0 dB	2.00

Note 1 The U_{95} is the expanded uncertainty of measurement for a 95% confidence interval. It represents the estimated range in which the true value lies for 95 out of 100 repeated events.

4.0 Results and discussion

All scenarios have been assessed against the daytime assigned levels. The predicted noise emissions at the key receiver locations are presented in **Table F** and corresponding noise contour maps (L_{Aeq} basis) are illustrated in **Appendix B**.

In addition, the noise generated from loader, crusher, screen, excavator, watercart, sand loading and truck movements is generally broadband in nature, and does not exhibit prominent tonal characteristics or amplitude modulation at the distances of interest.

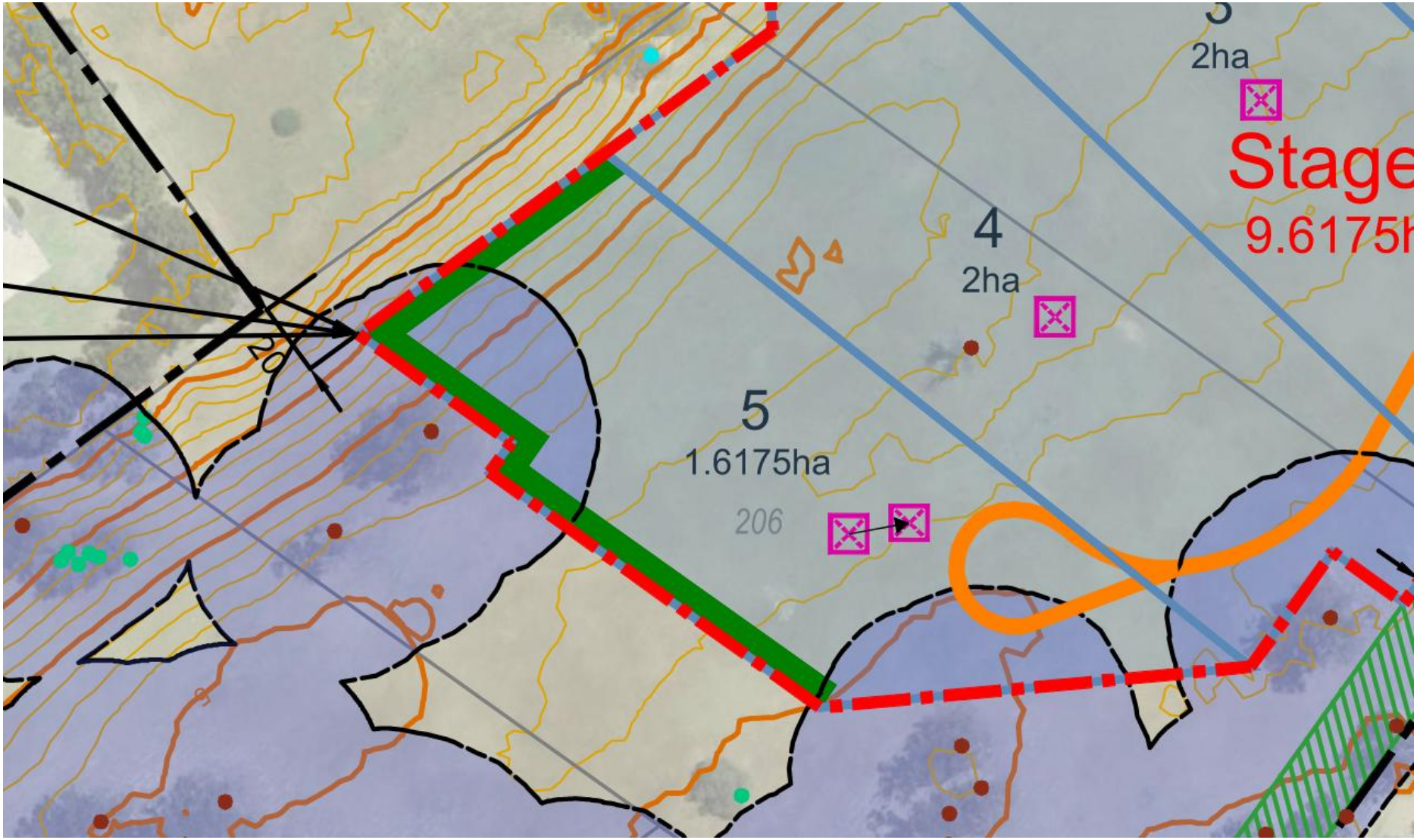
Table F: Predicted Operational Noise levels and Assessment, L_{A10} dB

Scenario	Location	Predicted noise emission	Adjustment (Table C)	Adjusted noise level	Assigned noise level (Table B)	Predicted outcome
Scenario 1	R-1	59	-	59	61	Compliant
	R-2	47	-	47	49	Compliant
	R-3	44	-	44	47	Compliant
	R-4	48	-	48	51	Compliant
Scenario 2	R-1	58	-	58	61	Compliant
	R-2	49	-	49	49	Compliant
	R-3	45	-	45	47	Compliant
	R-4	51	-	51	51	Compliant
Scenario 3	R-1	55	-	55	61	Compliant
	R-2	47	-	47	49	Compliant
	R-3	43	-	43	47	Compliant
	R-4	49	-	49	51	Compliant
Scenario 4	R-1	54	-	54	61	Compliant
	R-2	49	-	49	49	Compliant
	R-3	44	-	44	47	Compliant
	R-4	51	-	51	51	Compliant
Scenario 5	R-1	53	-	53	61	Compliant
	R-2	49	-	49	49	Compliant
	R-3	44	-	44	47	Compliant
	R-4	52	-	**52**	51	Marginal

Under Scenario 5, predicted noise levels at the Receiver R-4 marginally exceed the assigned level. Although this exceedance is minor, it is noted that there are many practicable mitigation options if required. These options would include but are not limited to:

- Repositioning the crusher approximately 15 m to the east, closer to the haulage route, as shown **Figure 8**; or
- Constructing a 3 m high bund or placing a shipping container adjacent to the crusher such that it screens noise from the crusher in the direction of the nearest noise sensitive receivers.

Figure 8 The new crusher location



5.0 Summary

SLR Consulting Australia Pty Ltd (SLR Consulting) has undertaken a noise assessment to evaluate the noise levels from the proposed sand extraction operations at the nearby noise-sensitive receivers. The assessment focusses on the receivers located closest to the site to determine the level of compliance at all nearby noise-sensitive premises.

Based on the assessment of five different scenarios, noise emissions associated with the proposed sand extraction activities are generally predicted to comply with the applicable daytime assigned noise levels at the nearest noise-sensitive receivers under the modelled worst-case conditions. Implementation of the recommendations outlined in **Section 4.0** will address any potential marginal exceedance.

Overall, the proposed operations are assessed as able to practicably comply with the relevant regulatory requirements.

Appendix A Terminology

Terminology

1. Sound Level or Noise Level

The terms 'sound' and 'noise' are almost interchangeable, except that 'noise' often refers to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure. The human ear responds to changes in sound pressure over a very wide range with the loudest sound pressure to which the human ear can respond being ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2 x 10^{-5} Pa.

2. 'A' Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dB, which if there is a subscript 'A' is measured using a sound level meter with an 'A-weighting' filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4,000 Hz), and less sensitive at lower and higher frequencies. Different sources having the same dB level generally sound about equally loud.

A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB to 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change corresponds to an approximate doubling or halving in loudness.

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as 'linear' or 'Z' weighted.

3. Sound Power Level

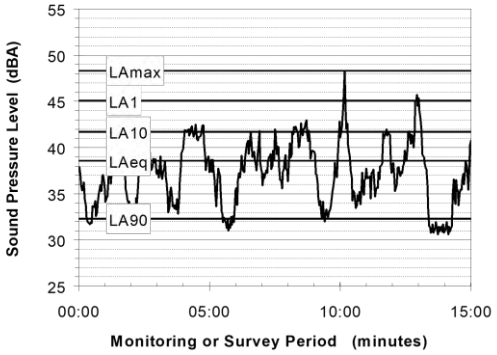
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are also expressed in decibels (dB), but in practice may be identified with a 'w' subscript, e.g. SWL, PWL or L_W, and by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure is similar to the effect of an electric radiator, which is characterised by a power rating but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4. Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

LA1 The noise level exceeded for 1% of the 15 minutes interval.

LA10 The noise level exceeded for 10% of the 15 minutes interval. This is commonly referred to as the average maximum noise level.

LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

LAeq The A-weighted equivalent noise level (basically, the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

5. Frequency Analysis

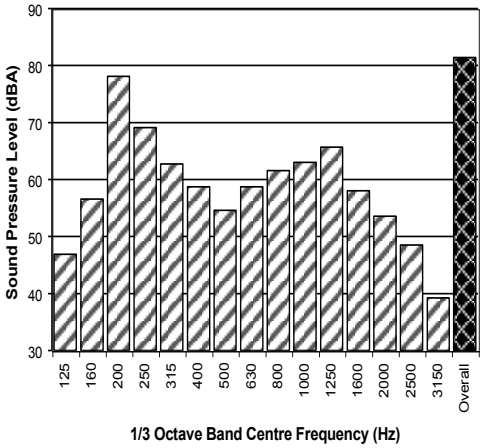
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (three bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band.



Appendix B Grid Noise Maps

Figure 9: Grid noise map of Scenario 1, L_{Aeq} dB

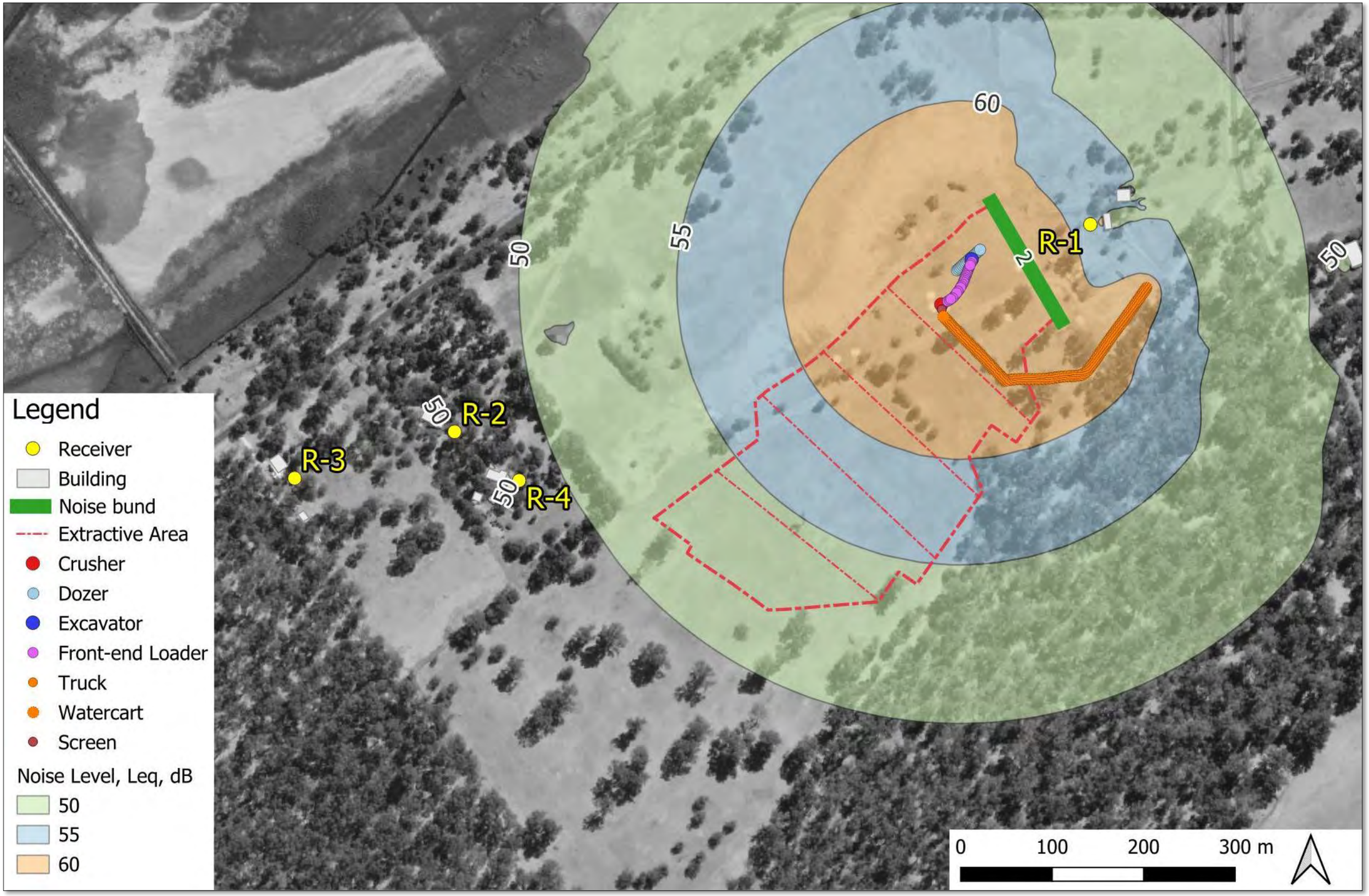


Figure 10: Grid noise map of Scenario 2, L_{Aeq} dB

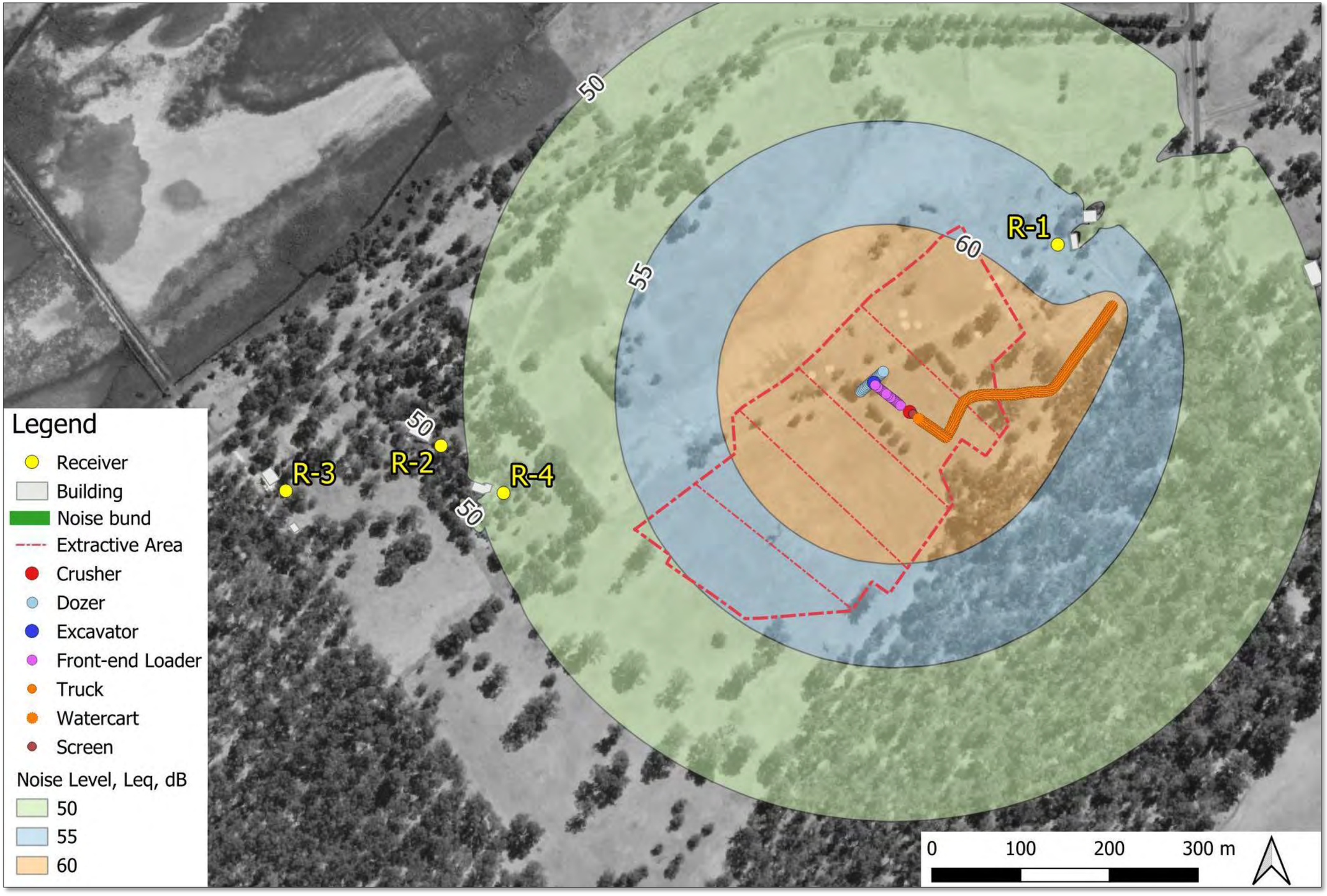


Figure 11: Grid noise map of Scenario 3, L_{Aeq} dB

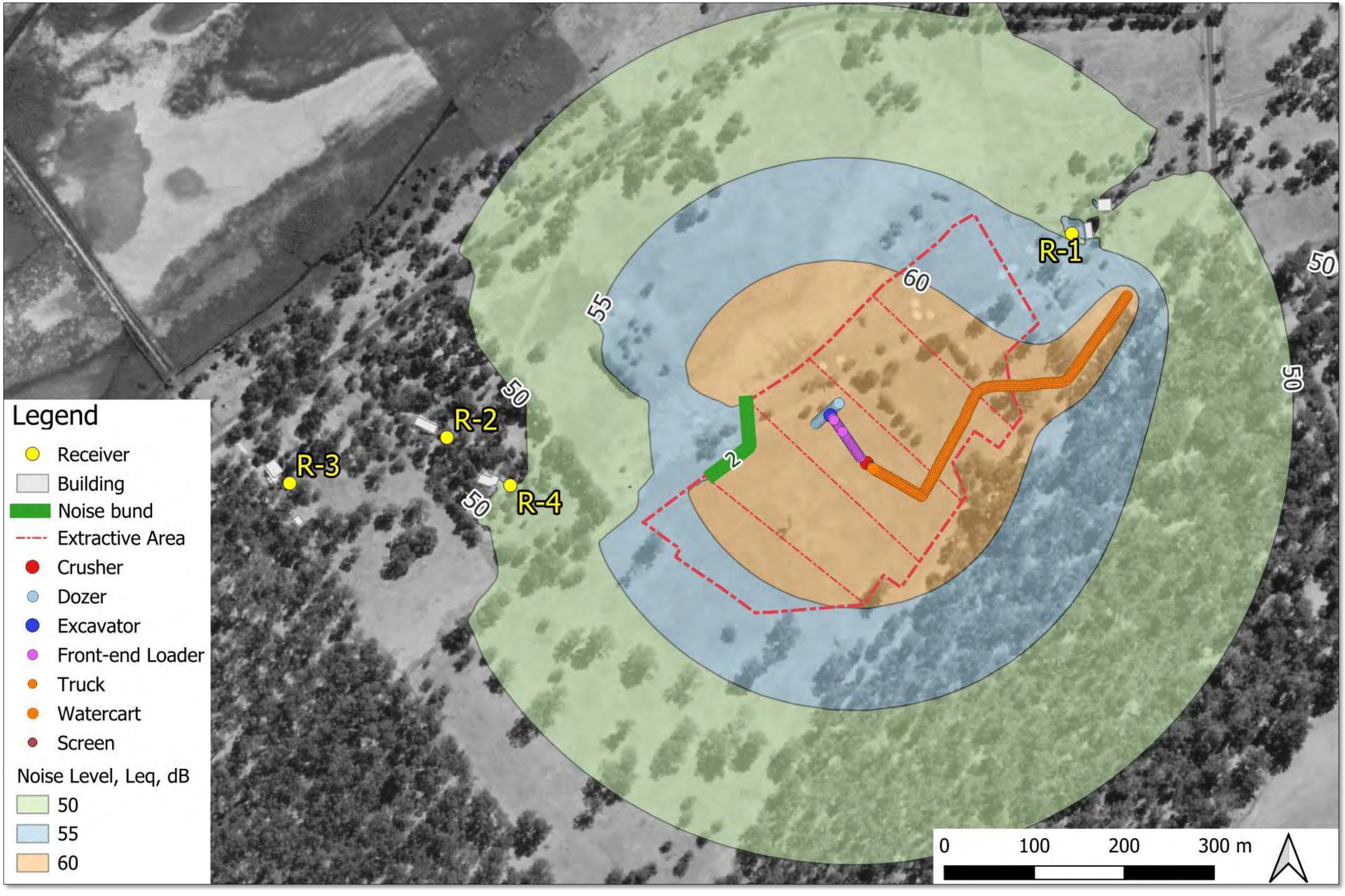


Figure 12: Grid noise map of Scenario 4, L_{Aeq} dB

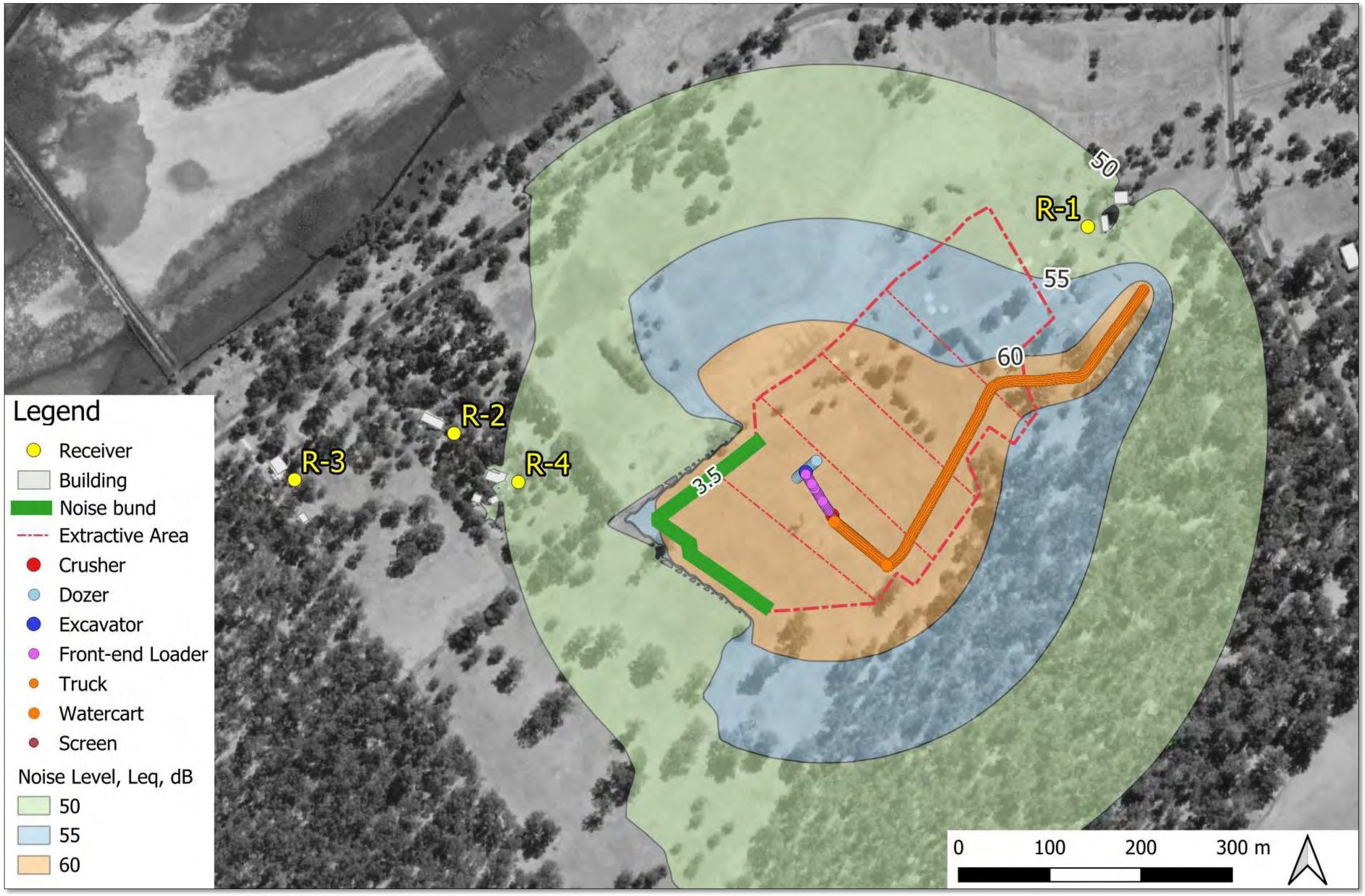
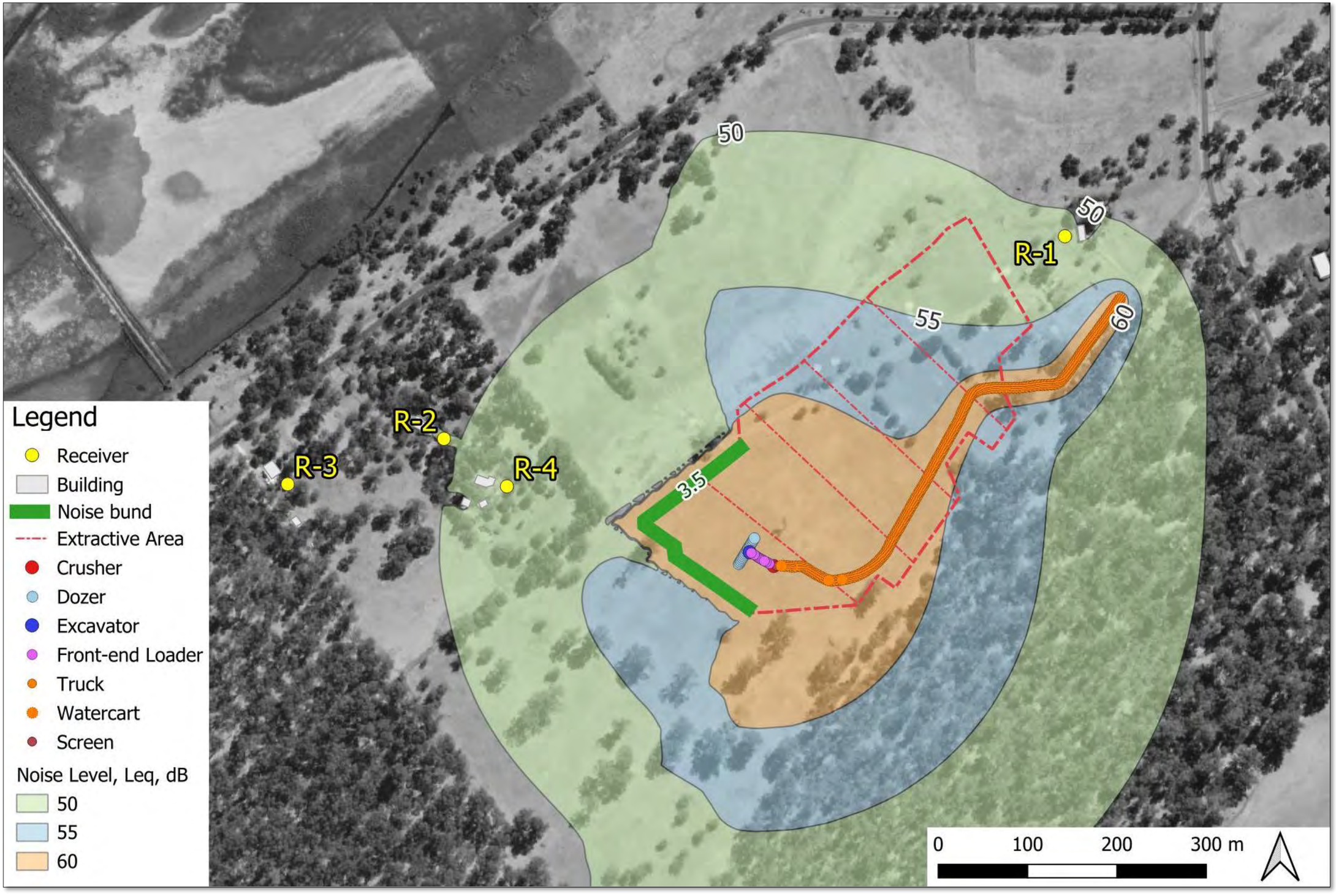
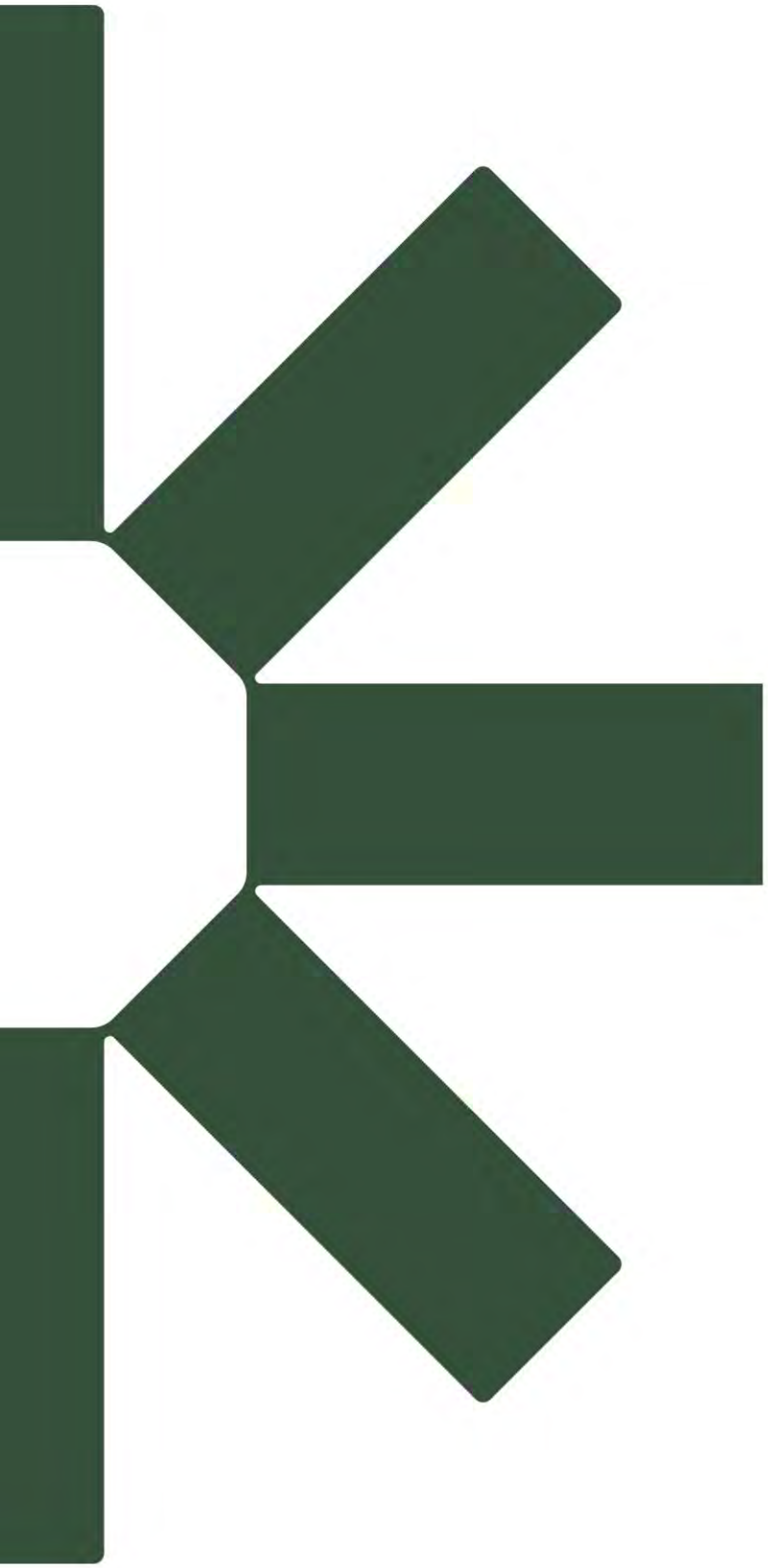


Figure 13: Grid noise map of Scenario 5, L_{Aeq} dB





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APPENDIX C - COMPLAINTS REGISTER

Complaints Register

Ref. No.	Date	Name & Address of Complainant	Time/Date of Complaint	Detail of Complaint	Summary of Actions Taken	Shire Notified	Person Responsible

APPENDIX F – DUST MANAGEMENT PLAN

DUST MANAGEMENT PLAN

LOTS 167 (No.365), 204, 205, 206 & 207 (No.363) MALLOKUP ROAD AND LOTS 159, 168 & 203 LUDLOW ROAD NORTH, STIRLING ESTATE

MAY 2026

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Document Control

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V3	18/05/2026	NC	KMT
Filename	2573_365 Mallokup Rd DMP_V3		

Limitations

This report has been prepared by Accendo Australia Pty Ltd in accordance with the scope limitations provided in this report, or as otherwise agreed, between the Client and Accendo.

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.

This report has been prepared based upon data and other information provided by the Client and other individuals and organisations, most of which are referred to in the report, which Accendo has not independently verified or checked beyond the agreed scope of work. Accendo does not accept liability in connection with such unverified information.

The conclusions and recommendations in this report are based on assumptions made by Accendo described in this report where and as they are required. Accendo disclaims liability arising from any of the assumptions being incorrect.

The report is based on site specific conditions encountered and information received at the time of preparation of this report or the time that site investigations were undertaken. Accendo disclaims responsibility for any changes that may have occurred after this time.

The preparation of this report has been undertaken and performed in a professional manner, in consideration of the scope of services and in accordance with environmental consulting practices. No other warranty is made.

CONTENTS

TABLES

FIGURES

1 INTRODUCTION

1.1 Background

Dunkley Holdings Pty Ltd (the applicant) is proposing to extract sand and limestone from a 9.62 hectare (ha) area within Lots 167 (No. 365), 204, 205, 206 and 207 (No. 363) Mallokup Road and 159, 168 and 203 Ludlow Road North, Stirling Estate (herein referred to as the subject site) (refer to **Figure 1** and **2**).

This application is made for a five year period however, the exact life of the project is difficult to estimate as it will be dependent on supply and demand trends.

The available volume of sand and limestone (*insitu* volume of approximately 300,000 m^3) is to be extracted, commencing in the northeast of the subject site moving in a southwest direction. The face and walls of the pit will act as noise barriers (refer to **Appendix A**).

The slope of the final contours of the pit will be approximately 1 metre (m) Australian Height Datum (AHD).

Slopes of the batters at the end of excavation will be retained at 1:6 vertical to horizontal.

1.2 Purpose and Scope

This Dust Management Plan (DMP) has been prepared to fulfil the relevant requirements provided within the Shire of Capel's *Local Planning Scheme No. 8* and *Local Planning Policy No. 6.2 Extractive Industries*. It is intended to provide the Shire of Capel, the public and relevant government agencies with an understanding of the proposal and the environmental strategies and commitments proposed to address dust emissions associated with the proposed land use. This document has been prepared to support and should be read in conjunction with, the *Environmental Management Plan* prepared by Accendo Australia (2026) for sand and limestone extraction within the subject site.

Recognised industry standard practices for dust control are well-established within Western Australia. The utilisation of these standard practices is proposed at the subject site to suppress dust and reduce potential impacts associated with dust emissions.

Management of these activities are an effective means to prevent adverse effects of dust. The purpose of this DMP is to review the risks and control measures to appropriately manage dust and mitigate its impact.

The scope of the DMP is to cover the following:

- Legislative and regulatory compliance;
- Existing environment;
- Risk assessment of potential dust sources and air quality impacts;
- Mitigation and measurement measures; and
- Roles and responsibilities in relation to dust management.

2 EXISTING ENVIRONMENT

2.1 Land Use

The subject site is zoned 'Priority Agriculture' pursuant to the Shire's *LPS No.* 8 and 'Rural' under the *Greater Bunbury Region Scheme (GBRS)*. The subject site has previously been used for agriculture.

Properties to the north and west are zoned 'Priority Agriculture' under *LPS No. 8* and 'Rural' under the *GBRS*. Beyond the properties to the west lies the Tuart Forest National Park, which also adjoins the subject site to the south and east and is zoned 'Public Open Space' under the *LPS No. 8* and 'Regional Open Space' and 'Rural' under the *GBRS*. Properties to the east are also zoned 'Priority Agriculture' under the *LPS No. 8*, and 'Regional Open Space' and 'Rural' under the *GBRS.*

Historically, the subject site has been used for livestock grazing, resulting in the disturbance of native vegetation onsite. The subject site is comprised of pasture areas that have been 'parkland cleared' with paddock trees consisting of planted *Eucalyptus gomphocephala* (Tuart) and *Agonis flexuosa* (Peppermint) and other non-native species.

2.2 Sensitive Receptors

The Environmental Protection Authority (EPA) *Guidance for the Assessment of Environmental Factors* (June 2005) provides generic separation distances to assist in the determination of suitable buffers where industry may have the potential to affect the amenity of a sensitive land use. In particular, for extractive industries, a buffer distance of 300 m to 500 m is recommended from sensitive land uses. A conservative buffer of 500 m to sensitive receptors has been adopted for this proposal given that onsite screening and crushing is proposed.

The closest residential dwellings to the subject site are provided below and shown in **Figure 3.**

Table 1. Residential dwellings within 1,000 m of the subject site.

Resident No.	Distance to subject site (m)
Lot 202 Ludlow North Road	162
Lot 202 Ludlow North Road	254
Housing Estate	260
Lot 51 Ludlow North Road	263
Lot 201 Ludlow North Road	395
Lot 50 Mallokup Road (Chalet accommodation)	540
Lot 52 Mallokup Road	680
Lot 123 Mallokup Road	991
228 Mallokup Road	1241

The closest residential dwelling to the subject site is located approximately 162 m to the northwest. A housing estate consisting of 11 houses is located approximately 260 m from the subject site. Additionally, a short stay accommodation business is located approximately 540 m to the north of the subject site.

2.3 Climate

The climate of the locality is classified as Mediterranean with warm to hot dry summers and cool wet winters.

The closest weather recording station is Bunbury (Station 9965). Temperatures are highest on average in February, at approximately 30.2°C. July has the lowest average temperature of the year of 7.4°C.

Rainfall at the closest weather recording station Capel North (Station 9992), is approximately 673 mm per annum with approximately 90% of the rain falling during the winter months, April to October inclusive.

During the summer months the dominant wind in the mornings is from the south-east at 17-18 knots, swinging to the south-west at approximately 22 knots in the afternoon. During winter, the winds are most commonly 12-19 knots from no dominant prevailing direction. During storms, winds from the west and north-west can reach 40 knots (BoM 2020).

Rainfall intensity has been calculated using the Bureau of Meteorology (BoM) Intensity-Frequency-Duration (IFD) data system which yields the two hour 1 in 10 (10%) annual exceedance probability storm event for the subject site as 41.3 mm/hr.

3 EXTRACTION ACTIVITIES

The sand and limestone quarry will cover an area of approximately 9.6 ha, with a current maximum elevation ranging from 5 m AHD to 1.5 m AHD. It will be excavated to an elevation of 1 m AHD commencing in the northeast of the subject site moving in a southwest direction. Extraction activities will be divided into five stages, each will be no greater than 2.0 ha in size (refer to **Appendix A**).

It is estimated that the total maximum volume of sand and limestone to be removed will be approximately 300,000 m^3 with up to 60,000 m^3 excavated each year, depending on supply and demand.

Earthen bunds for noise mitigation will be constructed with topsoil and overburden that will be stripped from the extraction footprint and other areas on the northeastern boundary. Construction of the bunds will be undertaken with an excavator and loader.

The planned end use of the pit is to restore a natural soil profile and return the area to pasture, ensuring that there is no net loss of agricultural land.

3.1 Operational Works

Using an excavator or loader, the topsoil (where available) will be stripped and placed in stockpiles. Overburden, if present, will be removed using a dump truck and stockpiled to the perimeter of the proposed pit area.

Typical operating hours for quarries will be adopted for the subject site which involves 7am to 6pm each Monday to Friday and Saturdays 7am to 12pm, excluding public holidays.

3.1.1 Sand Extraction

The sand and limestone will be excavated by an excavator and loader to a stockpile or loaded directly to waiting trucks for transport. A summary of the proposed sand and limestone extraction activities are provided below:

- Excavation will commence in the northeast of the quarry and move in a south westerly direction, while maintaining a 10 m buffer from the dripline of the Tuart trees. The face and walls of the pit will act as noise barriers.
- Upon completion of each section of quarry, the section will be reformed and back filled using a combination of equipment such as a tracked bobcat, excavator and front-end loader, where subgrade material is available, to achieve the proposed final contours.
- At the end of excavation, the noise bunds will be removed, and the floor of the quarry will be deep ripped, covered by overburden and topsoil, and rehabilitated to a constructed soil.

3.1.2 Final Contours

The final surface contours of the quarry will be approximately 1 m AHD.

Slopes of the batters at the end of excavation will be retained at 1:6 vertical to horizontal which will enable the landform to be integrated with the surrounding landscape.

This batter can be readily traversed by livestock, vehicles and machinery and is considered appropriate for the site's topographical relief.

3.1.3 Equipment

All operational equipment will work on the pit floor to provide maximum sound and visual screening. All equipment and infrastructure will be fully portable to facilitate movement throughout the site required for staged operations. The site will be secured by locked gates when it is not being actively worked. The boundary fencing will be maintained to prevent inadvertent and unauthorised entry.

Equipment and facilities that may be used onsite are provided in the Table below.

Table 2. Equipment.

Equipment	Description
Site office and/or containers	May be required for the management and security of small items.
Toilet	A portable toilet may be required on site.
Watercart	Used for dust suppression on the access roads and working floors when required.
Bulldozer	Topsoil will be stripped using a bulldozer. Bulldozers will also be used for the movement of material and loading trucks.
Front End Loader	Loaders will be used for the movement of material and loading road trucks.
Excavator	An excavator may be used for the removal of material.
Mobile crushing and screening plant	Mobile crushing and screening plant (licensed by DWER) will be utilised for the processing of material. Mobile screening and crushing plants are to be used for the preparation of various grades of sand and limestone.
Fuel storage	No fuel will be stored onsite.
Light vehicles	Access to and around the site.
Truck	Transport of sand and limestone to crusher and removal of sand and limestone from site.

3.1.4 Water Usage

Water is only required for dust suppression within the quarry and the access road. Water will be sourced onsite from an existing bore. A DWER licence will be obtained for the extraction of water upon receipt of planning approval.

4 POTENTIAL IMPACTS

4.1 Dust Sources

The proposed extraction activities will involve the disturbance of large quantities of soil and earthen material. Specifically, this may include the following activities:

- Earthworks during extraction activities;
- Topsoil stripping;
- Loading and transportation of material;
- Vehicle movement within the site; and
- Wind erosion of exposed surfaces.

These activities have the potential to generate dust that, if not adequately controlled, can cause nuisance and safety risks. In-pit operations tend to generate less dust than surrounding activities due to the reduced airflow within the pit. The removal and replacement of topsoil material has the highest risk associated with dust generation due to the large volumes of material involved and generally lower levels of soil moisture.

4.2 Risk Assessment

In accordance with the DWER's "*A guideline for managing the impacts of dust and associated contaminants from land development sites, contaminated sites remediation and other related activities*", a risk assessment for dust emissions has been prepared (DWER 2021).

For a site that is generating uncontaminated dust, such as extractive industry sites, the site classification chart in Appendix 1 of the DWER guideline can be used for assessing the site risk. Appendix 1 also details the provisions and contingency arrangements for dust management which apply to each site classification score.

The site classification assessment is provided below.

Part A. Nature of site

Item	**Score Options**				**Score**
1.Nuisance potential of soil when disturbed	Very low - 1	Low – 2 *Material is of coarse composition*	Medium - 4	High - 6	2
2. Topography and protection provided by undisturbed vegetation	Sheltered and screened - 1	Medium screening – 6	Little screening – 12 *Screening provided by stabilised bunds and roadside vegetation*	Exposed and wind prone - 18	12
3. Area of site disturbed by the works	Less than 1ha - 1	Between 1 and 5ha – 3	Between 5 and 10ha – 6	More than 10ha - 9	3

		Excavation will occur in stages less than 2 ha.			
4. Type of work being done	Roads and trenches - 1	Roads, drains and medium deep sewers - 3	Roads, drains, sewers and partial earthworks - 6	Bulk earthworks – 9 *Sand extraction*	9
Total score for Part A					26

Part B. Proximity of site to other land uses

Item	**Score Options**				**Score**
1.Distance of other land uses from site	More than 1km - 1	Between 1km and 500m – 6	Between 100m and 500m - 12	Less than 100m - 18	12
2. Affect of prevailing wind direction (easterly) on other land uses	Not affected - 1	Isolated land uses affected by one wind direction – 6	Dense land uses affected by one wind direction – 9	Dense/sensitive land uses highly affected by prevailing winds - 12	6
Total score for Part A					18

Site Classification Score (A x B) = 468

Classification 3 (score between 400 and 799, considered **Medium risk**). The provisions, contingency arrangements and monitoring requirements as specified by the DWER (2011) associated with a Classification 3 proposal are provided below.

Provisions:

Appropriate wind fencings of a length specific in the air quality management programme needs to be stored on site or available within one hour of being required by the engineer for the developer/local government/DEC.

All areas of disturbed land should be stabilised to ensure that the disturbed area exposed at any time is kept to a practical minimum to prevent exceedance of dust standards.

The engineer for the develop shall maintain close control of works with dust creating potential (for example allowable length of open trenching).

After all siteworks are completed, and before the contractor has vacated the site, the developer should ensure that the entire site is stable. The develop then retains responsibility for site stability until change of ownership/control takes place. After the change of ownership/control has taken place, the new owner or controlling party will inherit responsibility for site stabilisation.

Contingency arrangements:

Suitable water-carts in good working condition and of not less than 10,000 litres capacity per 7.5 ha of disturbed site, or other suitable alternatives shall be available to commence watering on the site within 18 hours of being required to do so by the engineer for the developer/local government/DEC.

Surface stabilisation equipment shall be available to commence operation on site within 48 hours of being required to do so by the engineer for the developer/local government/DEC and with sufficient capacity to cover the disturbed site area within a further 48 hours.

Wind fencing shall be erected within 18 hours of the contractor being required to do so by the engineer for the developer/local government/DEC. Dust generating works on the site shall cease in the interim.

If dust-related complaints are generated due to activities on the site, the developer may be required by the local government or an authorised DEC officer to distribute advisory notices to adjoining land occupiers within 48 hours. A notice form is provided in Sheet 5 of Appendix 1.

If dust-related complaints are generated due to material which has been excavated for trenching, the developer shall ensure this material is stabilised within 48 hours of being requested to do so by the engineer for the developer, local government or an authorised DEC officer.

Include an allowance for water-cart operation, wind fencing and surface stabilisation during the construction period for the purposes of dust and wind-borne material suppression.

Include an allowance for surface stabilisation for the purposes of dust and wind-borne material suppression to be maintained after the construction period and until change of ownership/control takes place.

Monitoring requirements:

Site dust management system in place.

On-site dust monitoring against short term criteria.

Off-site (compliance) dust monitoring at site boundary (if close to sensitive receptors) or at sensitive receptors.

Complaints management system in place (complaints recorded and acted on promptly).

Exceedances to be reported to the relevant authority – DEC, Local Government or DOH.

Notice to be erected at the site providing contact details of the person to be contacted.

4.3 Management Measures

While the potential impacts to amenity from dust emissions are considered medium at some receptors, standard dust suppression measures will be implemented during operation activities, as provided within **Table 3**.

Table 3. Dust management measures.

Legislation and Key Standards		
Environmental Protection Act 1986 (EP Act) *A guideline for managing the impacts of dust and associated contaminants from land development sites, contaminated sites remediation and other related activities* (DEC 2011)		
Objectives		
• Minimise dust lift during all activities. • No adverse dust impacts to sensitive receptors from the pit operations.		
Targets		
• No visible dust beyond the property boundary. • No dust complaints.		
Management Actions		
Description	**Responsibility**	**Timing**
Notice to be erected at the site, providing contact details of the person to be contacted regarding the works. This person will also be available outside of operational hours to address any complaints.	Site Manager	Prior to extraction
Induction for all employees will include information on: • Potential sources of dust • Dust Management Plan • Speed limits onsite and staying on designated roads • Reporting procedure for dust issues	Site Manager	Prior to extraction
Topsoil stripping shall not occur during the following conditions: • Winds in excess of 30 km/hr;	Site Manager	Topsoil stripping and bund construction

Areas of land cleared and the period of time they remain cleared are to be kept to a minimum.	Site Manager	At all times
Water trucks are to water down unsealed roads during operation to reduce dust lift.	Site Manager	As required
Stockpiles, where possible, will be limited to the anticipated cubic volume/vehicle movement for cartage on the following operating day.	Machine Operator	At all times
Temporary stockpiles and exposed areas will be watered and stabilised as required. Stabilisation techniques that will be considered depending on environmental conditions will include hydro-mulching.	Site Manager	As required
Topsoil stockpiles will be watered and stabilised as required. Stabilisation techniques that will be considered depending on environmental conditions will included hydro-mulching and/or seeding with cover crops such as (but not limited to) cereal rye.	Site Manager	As required
Minimise area impacted on and the time between extraction and rehabilitation (maximum 2 hectares open at any one time).	Site Manager	At all times
Managing operations to minimise dust emissions during windy conditions. Timing of earthworks (daily and seasonally) will coincide with periods of low wind velocity. Operations will cease if winds are observed on site to exceed 40 knots.	Site Manager	At all times
Water trucks are to be available at all times for immediate response during pit activities to water the site on observation of dust lift.	Site Manager	As required
Managing operations to minimise dust emissions during windy conditions. Timing of earthworks (daily and seasonally) will coincide with periods of low wind velocity. Operations will cease if winds are observed on site to exceed 40 knots.	Site Manager	At all times
Truck loads will be covered by tarpaulins during transport	Drivers	As required
Maintain a complaints register (refer to **Appendix B**). A Complaints Register will be established for the site to record the following information: • Date, time, location and nature of the exceedance. • Identify the cause (or likely cause) of the exceedance and responsible parties. • Identify the activities that were occurring at the time of the non-compliance. • Determine the activities that were most likely contributing to the non-compliance. • Describe what action has been taken to date.	Site Manager	As required

• Describe the proposed measures to address the exceedance.			
Monitoring			
Description	**Parameter**	**Responsibility**	**Frequency**
Visual monitoring of dust will be ongoing throughout the day during operations. All monitoring is to be maintained on a logging sheet for reference and proof of compliance.	Dust lift and signs of dust deposition near property boundary. Evidence of no visible dust crossing the site boundary will be used as the monitoring criteria for compliance.	Site Manager	Continuous
Contingency and Corrective Actions			
Incident or Consequence	**Corrective Action**	**Responsibility**	
Observation of excessive dust lift onsite	Report and investigate as incident.	Site Manager	
	Halt work within proximity of the area until cause of dust is addressed.	Site Manager	
	Increase dust mitigation measures (e.g. additional watering of exposed areas).	Site Manager	
Complaint received	Report and investigate as incident. To determine the validity of the complaint, the wind direction, wind speed and activities being undertaken on site at the time of the complaint will be established.	Site Manager	
	If required, halt work until cause of dust is addressed.	Site Manager	
	If the complaint is verified as being due to a site source, remedial action will be undertaken within 2 hours. The Shire of Capel will be advised of all complaints as soon as they are received. If a complaint cannot be resolved within the 2 hour response period, it may be necessary to cease operations.	Site Manger	
	Review dust management procedures and adjust if deemed necessary.	Site Manager	

REFERENCES

Accendo Australia (2026). *365 Mallokup Road, Stirling Estate, Environmental Management Plan*. Busselton, WA.

Department of Parks and Wildlife (DBCA) (2004). *Geomorphic Wetlands of the Swan Coastal Plain dataset*.

Department of Water and Environmental Regulation (2021). *A guideline for managing the impacts of dust and associated contaminants from land development sites, contaminated sites remediation and other related activities.*

Environmental Protection Authority (EPA) (2005). *Guidance for the Assessment of Environmental Factors.*

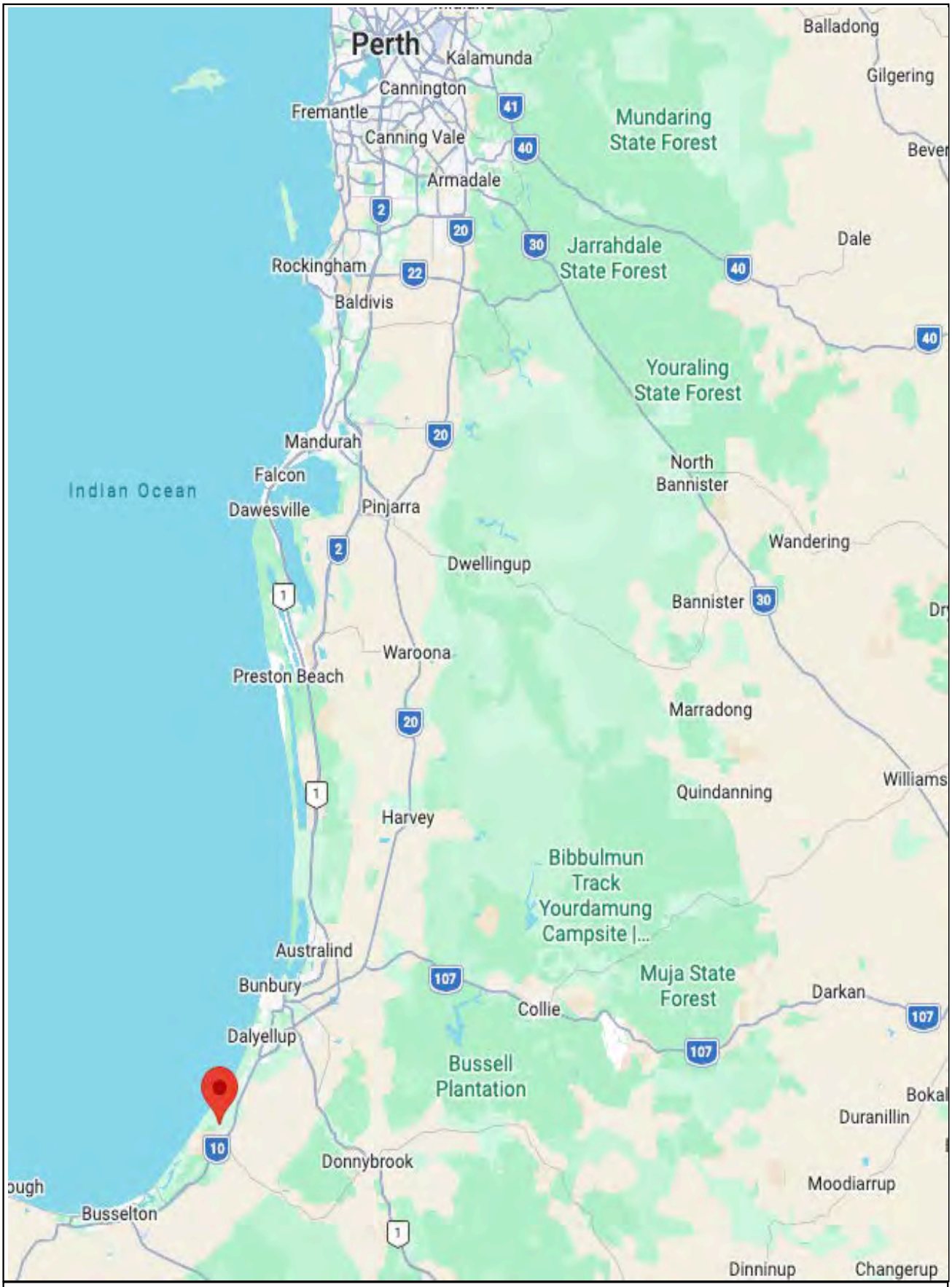
Environmental Protection Authority (EPA) (2006). *Guidance Statement No.10 for the Assessment of Environmental Factors (in accordance with the EP Act 1986: Levels of Assessment for Proposals Affecting Natural Areas Within the System 6 Region and Swan Coastal Plain Portion of the System 1 Region.*

Environmental Protection Authority (EPA) (2009). *South West Regional Ecological Linkages.* Bulletin No 8. Retrieved from: http://epa.wa.gov.au/EPADocLib/3040_SWREL_EPB821009.pdf

Semeniuk, C. A. & Semeniuk, V. (1995). *A geomorphic approach to global classification for inland wetlands*. Vegetation, 118, 103-124.

Western Australian Planning Commission (WAPC) (2007). *Planning Bulletin No. 64: Acid Sulfate Soils*, Western Australian Planning Commission, Western Australia.

FIGURES



PROJECT	365 Mallokup Road,Stirling Estate
DRAWING TITLE	Figure 1 – Site Locality
CLIENT	Dunkley Holdings Pty Ltd

Project Number	Drawing Number	Revision
2573	Figure 1	A

Designed NC
Drawn PN
Checked
Approved

Date 08/04/2026
Local Authority Shire of Capel
Sheet 1 of 1

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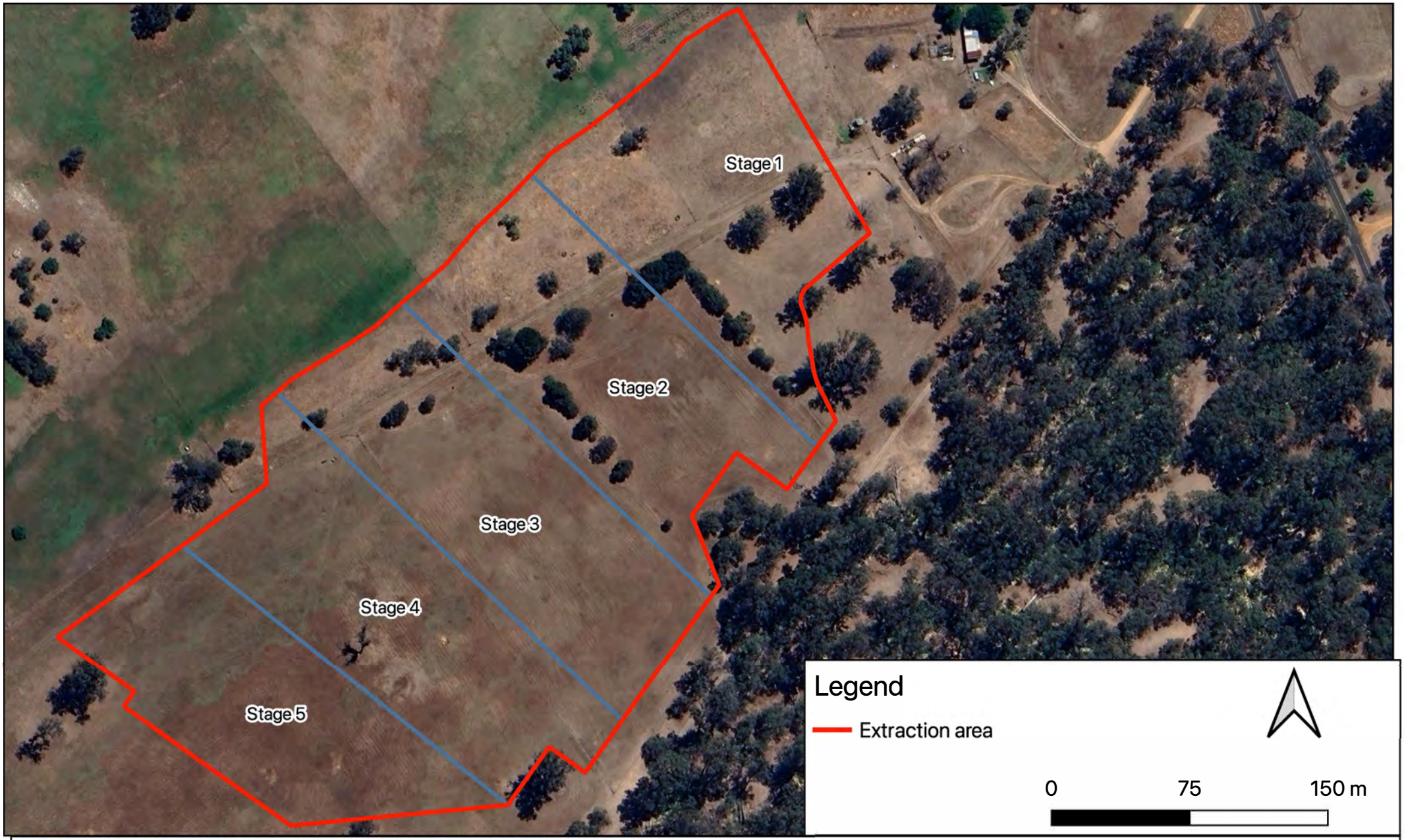

PROJECT	365 Mallokup Road, Stirling Estate
DRAWING TITLE	Figure 2- Site Extent
CLIENT	Dunkley Holdings Pty Ltd

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Western Australia 6280
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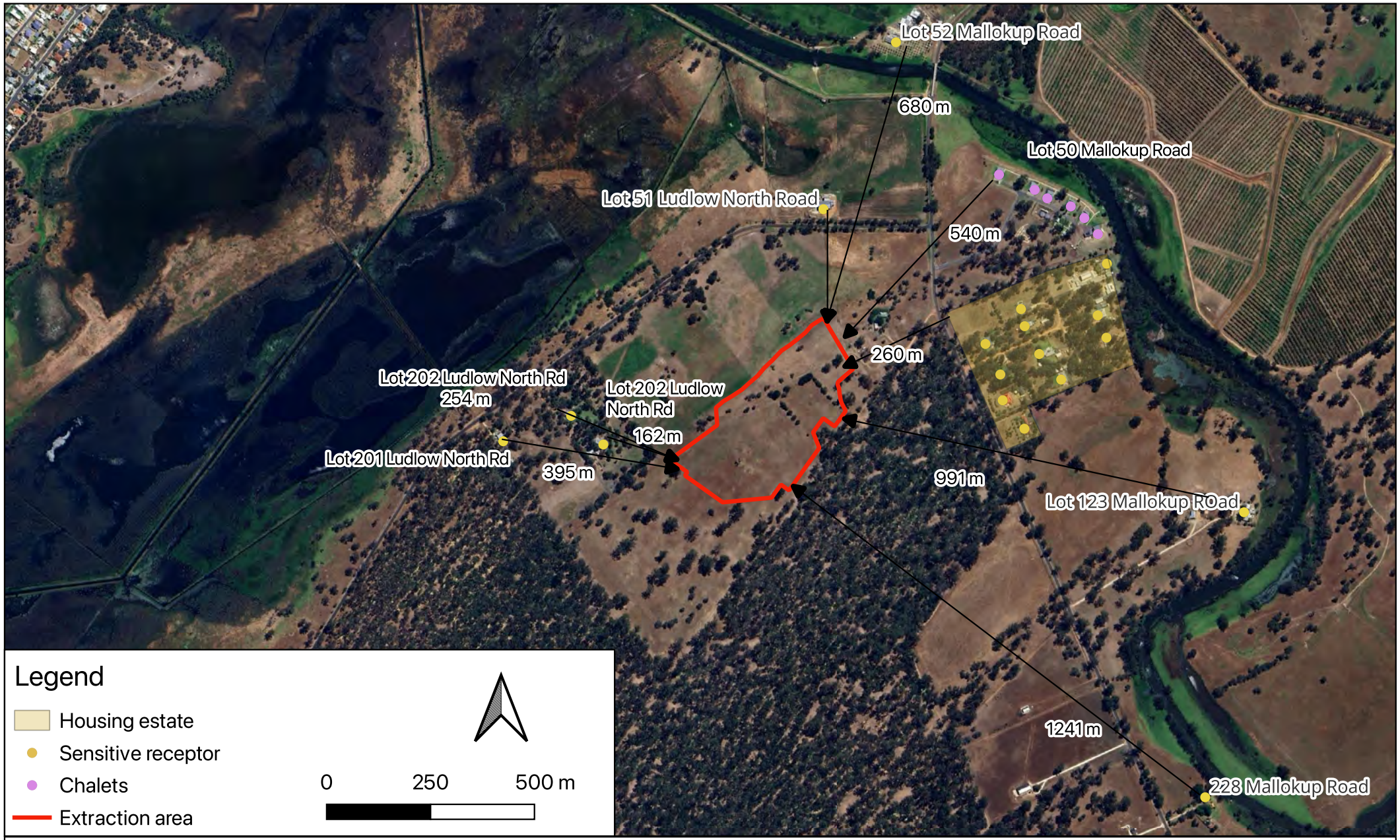
Project Number	2573	Designed	NC
Drawing Number	Figure 2	Drawn	PN
Revision	A	Checked	
Date	05/05/2026	Approved	
Sheet 1 of 1		Local Authority	Shire of Capel



PROJECT	365 Mallokup Road, Stirling Estate
DRAWING TITLE	Figure 3- Sensitive Receptors
CLIENT	Dunkely Holdings Pty Ltd

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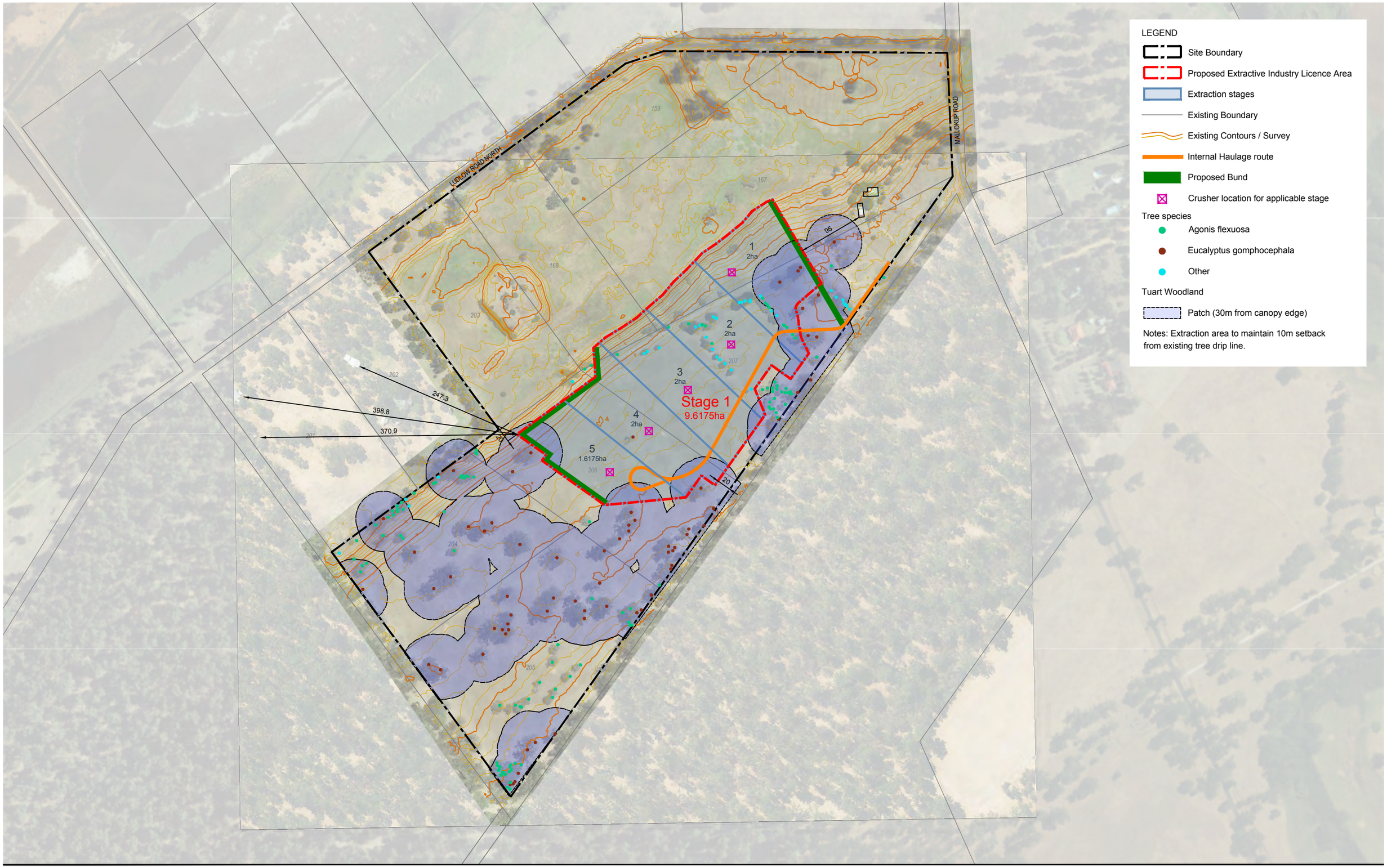
Project Number	2573	Designed	NC
Drawing Number	Figure 3	Drawn	PN
Revision	A	Checked	
Date	18/05/2026	Approved	
Sheet 1 of 1		Local Authority	Shire of Capel

APPENDIX A – EXCAVATION WORKS PLAN



Excavation Works Plan

Mallokup Road, Stirling Estate

0 100m

Date: 26 May 2026 Scale: 1:5000 @ A3 1:10,000 @ A1 File: **23-434 EX01A** Staff: HK JJ Checked: DL

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APPENDIX B- COMPLAINTS REGISTER

Complaints Register

Ref. No.	Date	Name & Address of Complainant	Time/Date of Complaint	Detail of Complaint	Summary of Actions Taken	Shire Notified	Person Responsible

APPENDIX G – REHABILITATION MANAGEMENT PLAN

REHABILITATION MANAGEMENT PLAN

LOTS 167 (No.365), 204, 205, 206 & 207 (No.363) MALLOKUP ROAD AND LOTS 159, 168 & 203 LUDLOW ROAD NORTH, STIRLING ESTATE

MAY 2026

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Document Control

Version	Date	Author	Reviewer
V1	02/05/2026	NC	KMT
V2	14/05/2026	NC	KMT
V3	18/05/2026	NC	KMT
Filename	2573_365 Mallokup Road RMP_V3		

Limitations

This report has been prepared by Accendo Australia Pty Ltd in accordance with the scope limitations provided in this report, or as otherwise agreed, between the Client and Accendo.

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.

This report has been prepared based upon data and other information provided by the Client and other individuals and organisations, most of which are referred to in the report, which Accendo has not independently verified or checked beyond the agreed scope of work. Accendo does not accept liability in connection with such unverified information.

The conclusions and recommendations in this report are based on assumptions made by Accendo described in this report where and as they are required. Accendo disclaims liability arising from any of the assumptions being incorrect.

The report is based on site specific conditions encountered and information received at the time of preparation of this report or the time that site investigations were undertaken. Accendo disclaims responsibility for any changes that may have occurred after this time.

The preparation of this report has been undertaken and performed in a professional manner, in consideration of the scope of services and in accordance with environmental consulting practices. No other warranty is made.

CONTENTS

TABLES

FIGURES

1 INTRODUCTION

1.1 Background

Dunkley Holdings Pty Ltd (the applicant) is proposing to extract sand and limestone from a 9.62 hectare (ha) area within Lots 167 (No. 365), 204, 205, 206 and 207 (No. 363) Mallokup Road and 159, 168 and 203 Ludlow Road, Stirling Estate (herein referred to as the subject site). The extraction area is approximately 3.8 kilometre (km) northwest of the Capel town site, within the municipality of the Shire of Capel (refer to **Figure 1** and **Figure 2**).

1.2 Purpose and Scope

The purpose of this Rehabilitation Management Plan is to provide a framework for the rehabilitation of the subject site post sand and limestone extraction works.

Specifically, the scope of this Rehabilitation Management Plan is to:

- Provide details of the site including location and the key environmental characteristics;
- Provide management aims and objectives for the rehabilitation area;
- Describe rehabilitation activities, their rationale and methodology;
- Provide success criteria and monitoring requirements; and
- Outline weed and pest control activities in addition to maintenance requirements.

1.3 Objectives

The objective is to return the land to a condition capable of supporting agricultural activities, with pasture production rates equivalent to or better than pre-mining production rates. This will include dryland pasture with a variety of species suitable for future grazing purposes.

2 EXISTING ENVIRONMENT

2.1 Land Use

The subject site is zoned 'Priority Agriculture' pursuant to the Shire's *LPS No.* 8 and 'Rural' under the *Greater Bunbury Region Scheme (GBRS)*. The subject site has previously been used for agriculture.

The subject site has previously been cleared of remnant vegetation with pasture and paddock trees remaining. The extraction area is currently used for agricultural grazing purposes.

2.2 Topography and Soils

The current topography of the subject site can be described as gently sloping with the elevation ranging from 5 metres (m) Australian Height Datum (AHD) in the southwest to 1.5 m AHD in the north (refer to **Appendix A**).

The Department of Primary Industries and Regional Development's (DPIRD's) Natural Resource Information (NRInfo) maps the extraction area as containing the following two soil phases (refer to **Figure 3**):

- Vasse Wonnerup wet flats phase- Poorly drained flats around the edge of the Vasse Estuary. Dark calcareous sands and mixed estuarine deposits; and
- Ludlow flats phase- Flats and very low dunes. Deep yellow brown siliceous sands over limestone (i.e. Spearwood Sands).

2.3 Climate

The climate of the locality is classified as Mediterranean with warm to hot dry summers and cool wet winters.

The closest weather recording station is Bunbury (Station 9965). Temperatures are highest on average in February, at approximately 30.2°C. July has the lowest average temperature of the year of 7.4°C.

Rainfall at the closest weather recording station Capel North (Station 9992), is approximately 673 mm per annum with approximately 90% of the rain falling during the winter months, April to October inclusive.

During the summer months the dominant wind in the mornings is from the south-east at 17-18 knots, swinging to the south-west at approximately 22 knots in the afternoon. During winter, the winds are most commonly 12-19 knots from no dominant prevailing direction. During storms, winds from the west and north-west can reach 40 knots (BoM 2020).

2.4 Flora and Vegetation

A vegetation survey by Plantecology Consulting (2025) found the vegetation within the subject site to be in a 'Poor' condition (refer to **Plate 1**). The subject site is comprised of pasture areas that have been 'parkland cleared', consisting of planted *Eucalyptus gomphocephala* (Tuart), *Agonis flexuosa* (Peppermint) and non-native tree species.

Plate 1: Vegetation within the subject site. Condition is rated as 'Poor' with no native species present (Plantecology Consulting 2025).

Surrounding the subject site to the east and south is vegetation mapped as the Tuart Woodland Threatened Ecological Community (TEC) (Plantecology Consulting 2025). The vegetation survey determined that the subject site only captures approximately 1.3 ha of a patch of Tuart woodland TEC. The patch that intersects the subject site do not contain any native vegetation.

None of the vegetation within the subject site is representative of any other vegetation communities of conservation significance.

The extraction footprint has been designed to avoid native vegetation as far as practicable.

3 EXTRACTION ACTIVITIES

The sand and limestone quarry will cover an area of approximately 9.6 ha, with a current maximum elevation ranging from 5 m AHD to 1.5 m AHD. It will be excavated to an elevation of 1 m AHD commencing in the northeast of the subject site moving in a south westerly direction. Extraction activities will be divided into five stages, each will be no greater than 2.0 ha in size (refer to **Appendix A**).

It is estimated that the total maximum volume of material to be removed will be approximately 300,000 m^3. Over a five year period, a maximum of approximately 60,000 m^3 will be excavated each year, depending on supply and demand.

Earthen bunds for noise mitigation will be constructed with topsoil and overburden that will be stripped from the extraction footprint and other areas on the northeastern boundary. Construction of the bunds will be undertaken with an excavator and loader.

The final surface contours of the quarry will be approximately 1 m AHD.

Slopes of the batters at the end of excavation will be retained at 1:6 vertical to horizontal which will enable the landform to be integrated with the surrounding landscape.

This batter can be readily traversed by livestock, vehicles and machinery and is considered appropriate for the site's topographical relief.

4 REHABILITATION MANAGEMENT PLAN

4.1 Objectives

The objective is to return the land to a condition capable of supporting agricultural activities, with pasture production rates equivalent to or better than pre-mining production rates. This will include dryland pasture with a variety of species to support future grazing purposes.

Table 1. Rehabilitation closure objectives and completion criteria.

Closure Objectives	Completion Criteria	Performance Criteria	Measurement Tool
A self sustaining cover of pasture	Crops cover the entire stage after completion of the rehabilitation works.	Less than 10 % bare ground.	Annual monitoring
Weed levels that are not likely to impact on the viability of reconstructed soils.	No declared weed species are present. Weed species are not competing with cover crop across the site.	Declared weed species absent from the rehabilitation area.	Annual monitoring
A safe and stable landform suitable for the proposed future land use.	No areas of erosion or soil collapse are observed.	Rehabilitation surface remains flat and stable, with no evidence of surface erosion.	Annual monitoring

4.2 Revegetation Works

4.2.1 Topsoil and Overburden Removal

Topsoil is an integral part of rehabilitation as it contains organic matter which assists in establishing vegetation when respread on disturbed areas.

Topsoil at the subject site will be stripped and stockpiled separately, prior to commencing quarrying. If possible, progressive rehabilitation will be undertaken whereby topsoil will be directly replaced onto a previously excavated area.

Topsoils should be stripped to a depth of approximately 150 mm. In some areas, topsoil depth may differ due to the topography of the subject site.

4.2.2 Landform Reconstruction and Contouring

Landform reconstruction and contouring will involve the following:

- The final landform will be approximately 1 m AHD.
- The post extraction landform will be designed with stage batters of no more than 1:6.
- Any bunds will be removed and the excavated floor will be deep ripped in two directions. The width between rip lines will be 1 m intervals.

4.2.3 Site Preparation

To ensure the success of the revegetation works, site preparation should occur well before planting is undertaken. This includes implementation of a weed control programme as outlined in **Section 4.3**.

In the event that compacted areas are identified within the revegetation area, contour ripping may be required. Ripping loosens soil aggregates and provides a softer soil surface for the establishment of plant roots. Ripping also promotes aeration of soil, assisting in the breakdown of organic matter and water infiltration.

4.3 Weed Management

The invasion of weeds and disease is a key threat to the conservation values of the subject site and the surrounding vegetated areas. Subsequently, the implementation of measures to limit or control weed infestation is necessary.

4.3.1 Weed Control

Pre-seeding weed control is only likely to be required where topsoils are used that contain weed species. Given the current land use, it is not anticipated that weed control will be other than normal agriculture practice. If required, weed control will only be conducted after overburden and topsoil have been spread and any seeds have been allowed to germinate.

Herbicides will be selected for the target species, taking into account the surrounding environment and the constraints this may present.

Based on the location and species of weeds present, the recommended weed treatments are detailed in **Table 2.** The timing for weed control is specified within **Table 3**.

Table 2. Weed control treatment.

Treatment	Suggested Constituents	Target Species
Glyphosate spray	2% Glyphosate including Pulse®, wetting agent and Chlorsulfuron	Broadleaf species e.g. *Pelargonium capitatum*
Selective grass spray	Fusilade and approved adjuvant (e.g. Pulse®)	Grass species e.g. *Ehrharta longifolia*

4.3.2 Weed Management Plan

The following weed and disease controls will be implemented within the subject site to assist in the control of invasive species and enhance the outcomes of the proposed rehabilitation works.

Table 3. Management actions for weed control.

Parameter	Action	Timing
Surface Material	Assess weed potential within topsoil material prior to removal and separate weed affected topsoil for treatment or disposal.	Prior to and during topsoil removal
	Stockpile all surface materials in the general vicinity of its origin.	Surface material removal
Hygiene Measures	Avoid moving surface material or fill material from weed infected areas to non-infested areas.	At all times
	All earthmoving and ground engaging equipment will be cleaned of vegetation, mud and soil prior to entry and exit of the subject site.	At all times
	No soil and vegetation should be brought to the site apart from that to be used in rehabilitation and plants used in rehabilitation should be free of weeds.	At all times

Parameter	Action	Timing
Access	Control access within the quarry area to reduce the spread of weeds, especially off-road vehicle access, to prevent disturbance to vegetation and weed invasion.	At all times
	Restrict access to areas outside the subject site to reduce the spread of weeds into or out of the site.	At all times
Weed Control	Chemical spraying is to be undertaken as per **Section 4.3.1**	Refer to **Section 4.6**
Monitoring and Reporting	Monitoring and reporting work are required to ensure that the revegetation objections are achieved.	

4.4 Rehabilitation

If required, ripping will be undertaken within the completed stages to reduce the potential for surface erosion and promote a seed bed for establishing pasture. During this process, a number of measures will be utilised to ensure maximum efficiency with minimal disturbance. Any ripping that occurs along slopes will have regular contour banks built across the tracks to prevent erosion from water runoff.

As far as possible, topsoil will be placed along the contour to help reduce erosion. Placing the topsoil in such a manner will reduce the down slope flow of water and increase water storage. The final landform will resemble the pre-mining landform where practicable (minus the excavated material). The overburden storage area will take into consideration the surrounding landform and as far as practicable match the surrounding features.

While no specific soil preparation is anticipated, the requirement for the application of lime and/or fertiliser can be determined by soil testing once the landform has been rehabilitated.

For pasture revegetation it is essential that the species are matched to the soil types and rainfall. The location falls into the “High Rainfall Coastal” planting regime with sandy to gravelly soils. Suitable perennial legumes include birdsfoot trefoil, lucerne, strawberry clover and sulla. Perennial pasture includes perennial ryegrass, phalaris, cocksfoot and Rhodes grass. Annual pasture species include ryegrass, serradella and subterranean clover.

The actual species used will be determined by the individual season, nature of the rainfall in the preceding months and stocking/hay production proposed by the landholder which may change from time to time.

Seeding rates are 2 – 5 kg/ha depending on the species used; for example, ryegrass is seeded at 3 kg/ha whereas Rhodes grass is seeded at 4 kg/ha. Seed will be broadcast uniformly within the marked areas in overlapping passes using mechanical equipment to allow for complete and even seed coverage of the pre-prepared area. Seed will be mixed with a bulking agent such as vermiculite, clean sand or sawdust in a ratio of 2 parts bulking agent to 1 part seed. If deemed necessary, seed will be covered by very light harrowing, scarifying, bagging, dragging or light raking of the seeded area as soon as practical and within the same day of seeding.

As previously discussed, it is proposed to return the extraction area to pasture for future grazing purposes. Rehabilitation will be undertaken in five stages, generally in the order of proposed excavation. Each stage of rehabilitation will be undertaken after the completion of the extraction of material.

4.4.1 Maintenance

Maintenance will be undertaken following seeding with all activities to be conducted in response to the maintenance inspections and monitoring (as discussed below). The key elements associated with

maintenance works will include suppression of smothering weeds and infill seeding. The requirement to implement revegetation maintenance and infill seeding measures will be determined following each monitoring event.

4.5 Monitoring and Reporting

A program of monitoring of the rehabilitation works is required to ensure that the objectives are achieved.

Maintenance inspections will be undertaken annually in spring by the proponent to determine the requirement for maintenance measures.

During these monitoring events, the area will be assessed to determine pasture and weed coverage within areas that have been rehabilitated.

4.5.1 Completion Criteria

To achieve the objectives of the Management Plan and ensure that future management is minimised, the measurable goals for rehabilitated areas are as follows:

- Self-sustaining crop cover with less than 10% bare ground;
- No declared weed species; and
- Rehabilitation surface remains flat and stable, with no evidence of surface erosion.

Maintenance will continue to be undertaken every year and for two years after closure or as required until this criterion has been achieved or as otherwise agreed with the Shire of Capel. Following the successful completion of the rehabilitation program, the Shire will, upon application from the owner, refund the bond lodged against the implementation of the Plan.

4.6 Scheduling

The rehabilitation will be undertaken on a progressive basis, depending on the completion of excavation stages. Accordingly, a definitive timeline for rehabilitation is not prescribed, but rather a commitment to establish pasture by the first month of August, following completion of a stage.

Rehabilitation works will be undertaken at the following specified times of year:

1. Spring/summer:
    - Excavated area to be graded to levels and contours conforming to the adjacent unaffected areas minus the thickness of the excavated material.
    - If required, deep ripping along the contour at 2 m intervals.
    - Embankment batters will be cut to no more than 1 in 6.
    - Stockpiled topsoil will be spread over the shaped surface.
2. Autumn:
    - Pre-seeding weed control.
3. Autumn/winter:
    - Seeding with appropriate agricultural seed mix.
    - If sufficient vegetation does not germinate following initial seeding, the area will be re-seeded.
4. Spring:
    - Maintenance inspections to determine extent of maintenance requirements.
    - Formal monitoring will be undertaken in areas that have been rehabilitated.

REFERENCES

Accendo (2026) *365 Mallokup Road ,Stirling Estate Environmental Management Plan*, unpublished. Busselton WA

Department of Biodiversity, Conservation and Attractions (DBCA) (2024). *Geomorphic Wetlands of the South West- Unreviewed dataset.* Accessed September 2025.

Department of Water and Environmental Regulation (DWER) (2019). Water quality protection note No. 15*, Basic Raw Materials Extraction.* DWER, Perth WA.

Environmental Protection Authority (EPA) (2006). *Guidance Statement No.10 for the Assessment of Environmental Factors (in accordance with the EP Act 1986: Levels of Assessment for Proposals Affecting Natural Areas Within the System 6 Region and Swan Coastal Plain Portion of the System 1 Region.*

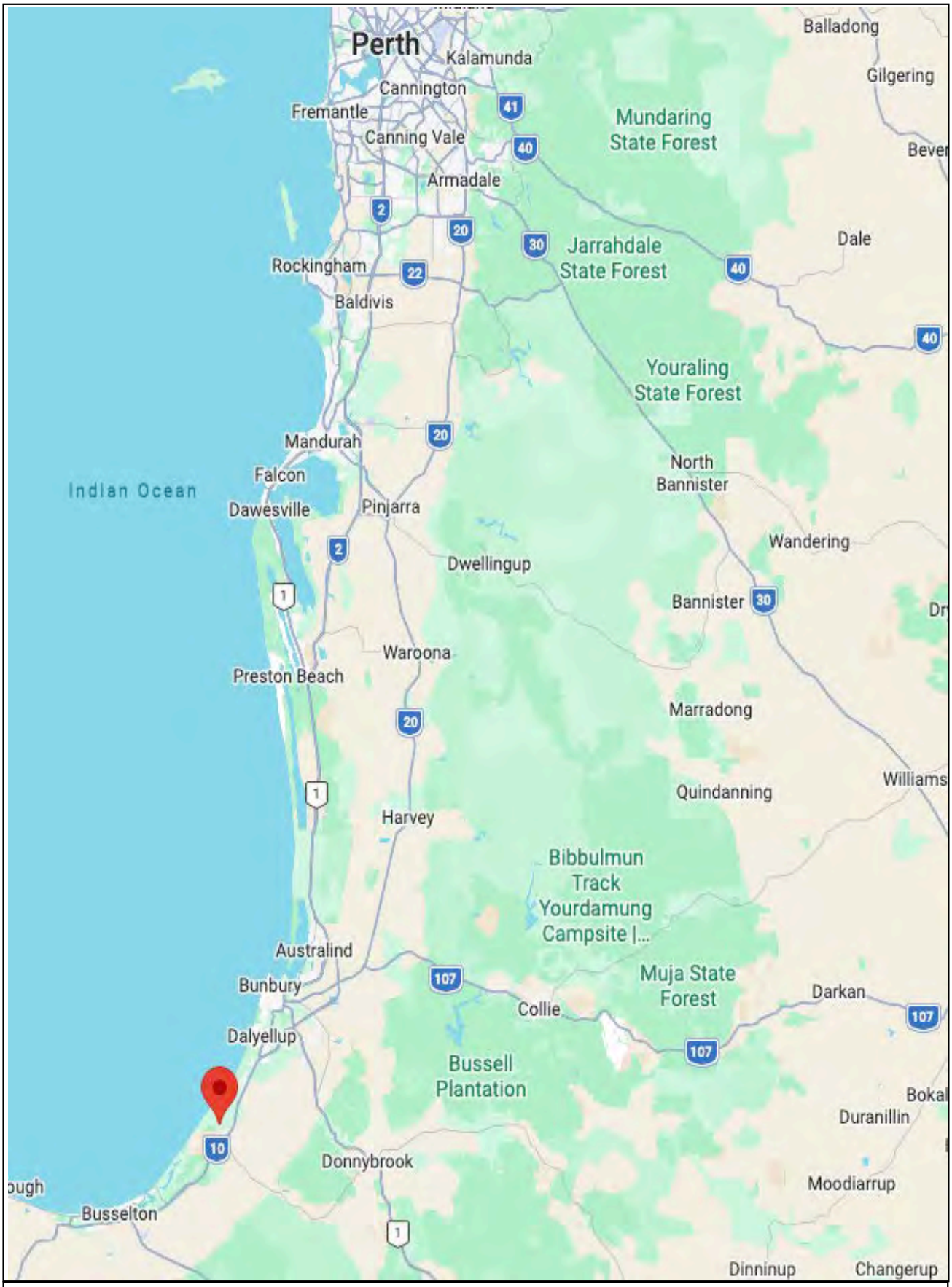
Environmental Protection Authority (EPA) (2009). *South West Regional Ecological Linkages.* Bulletin No 8. Retrieved from: http://epa.wa.gov.au/EPADocLib/3040_SWREL_EPB821009.pdf

Harewood (2025) *Fauna Assessment 365 Mallokup Road, Stirling Estate Capel*, unpublished, Bunbury WA.

Plantecology Consulting (2025) *Stirling Estate Tuart Woodland Survey*, unpublished, Kinglsey, WA

Thackway, R, and Cresswell, ID, (Eds) (1995). *An Interim Biogeographic Regionalisation for Australia: a framework for establishing the national system of reserves*, Version 4.0. Australian Nature Conservation Agency, Canberra.

FIGURES



PROJECT	365 Mallokup Road,Stirling Estate
DRAWING TITLE	Figure 1 – Site Locality
CLIENT	Dunkley Holdings Pty Ltd

Project Number	Drawing Number	Revision
2573	Figure 1	A

Designed NC
Drawn PN
Checked
Approved

Date 08/04/2026
Local Authority Shire of Capel
Sheet 1 of 1

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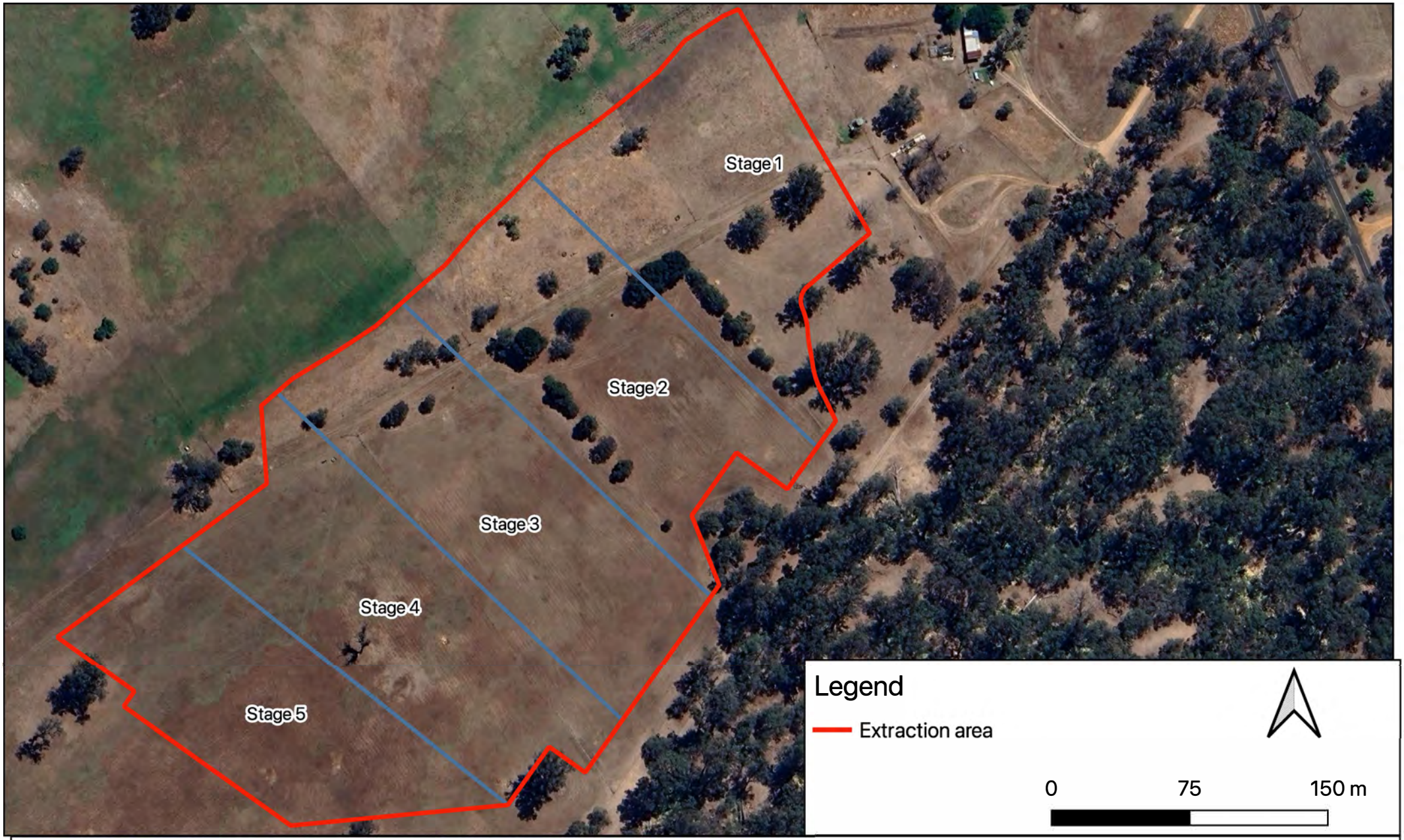

PROJECT	365 Mallokup Road, Stirling Estate
DRAWING TITLE	Figure 2- Site Extent
CLIENT	Dunkley Holdings Pty Ltd

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Project Number	2573	Designed	NC
Drawing Number	Figure 2	Drawn	PN
Revision	A	Checked	
Date	05/05/2026	Approved	
Sheet 1 of 1		Local Authority	Shire of Capel

PROJECT	365 Mallokup Road, Stirling Estate
DRAWING TITLE	Figure 3- Soil Landscape Mapping
CLIENT	Dunkley Holdings Pty Ltd

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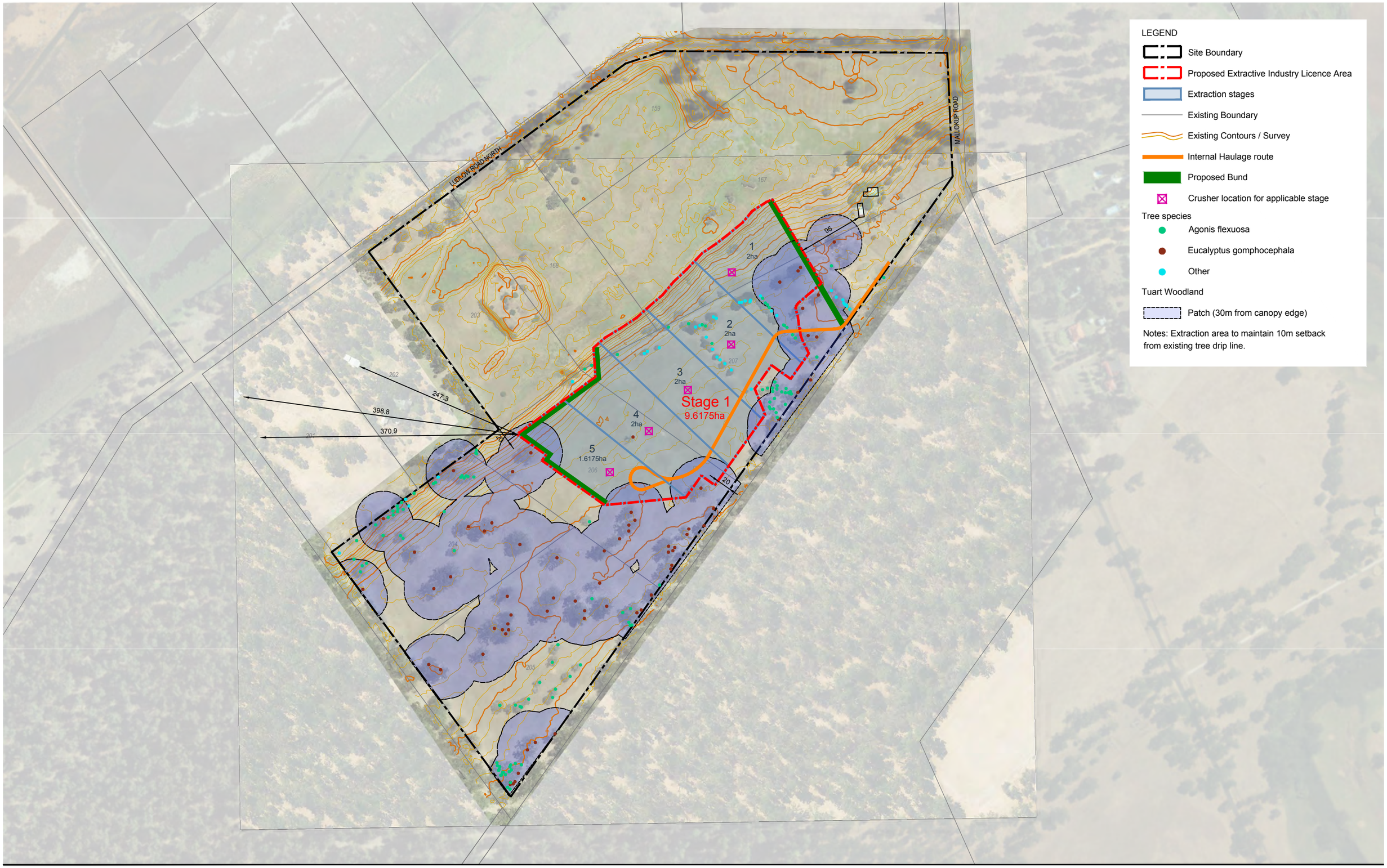
Project Number	2573	Designed	NC
Drawing Number	Figure 3	Drawn	PN
Revision	A	Checked	
Date	02/04/2026	Approved	
Sheet 1 of 1		Local Authority	Shire of Capel

APPENDIX A- EXCAVATION WORKS PLAN



Excavation Works Plan

Mallokup Road, Stirling Estate

0 100m

Date: 26 May 2026 Scale: 1:5000 @ A3 1:10,000 @ A1 File: **23-434 EX01A** Staff: HK JJ Checked: DL

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