Shire of Serpentine-Jarrahdale

Revegetation Plan

Lot 232 Cockram Street, Mundijong

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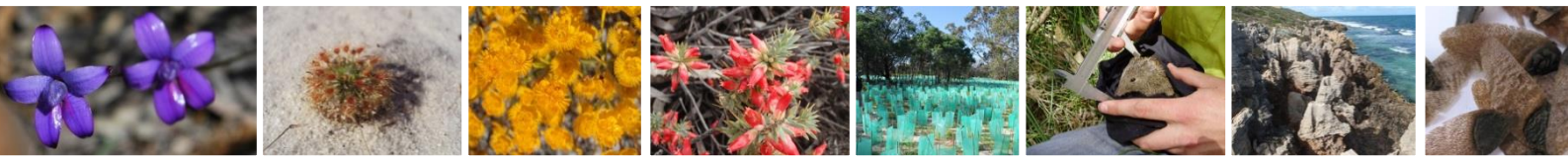

Acknowledgement of Country

Ngala kaaditj Noongar moort keyen kaadak nidja boodja.
Natural Area acknowledges the Traditional Owners of the lands on which we operate, and recognises their continuing connection to lands, waters and communities.

Disclaimer

System Certifications

Environmental management system registered to ISO 14001:2015
Quality management system registered to ISO 9001:2015
Occupational health and safety management system registered to ISO 45001:2018

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D1	March 2024	New Document	LC/KE	BC	Draft for client comment
V2	April 2024	Removal of watermark	KE	KG	Superseded
V3	Oct 2024	Addressing Client Comments	KE	JW	Released

Executive Summary

Natural Area Consulting Management Services (Natural Area) was contracted by the Shire of Serpentine-Jarrahdale (the Shire) to prepare an offset revegetation plan to satisfy requirements from the Department of Water and Environmental Regulation (DWER) for the required offset works associated with the Shire's clearing application CPS 8908/2. This revegetation plan will:

- provide relevant background information
- outline revegetation commitments
- describe reference sites
- describe revegetation activities and methodology
- outline revegetation objectives and completion criteria
- describe contingency plans if completion criteria are not met
- outline weed and pest control activities
- outline monitoring and reporting requirements
- provide indicative implementation schedule and budget
- describe project limitations and potential issues.

The revegetation plan was developed to satisfy the following requirements:

- installation of 33 native trees of black cockatoo foraging species
- revegetation of 0.16 ha with overstorey and understorey species in an extensively cleared landscape to mitigate impacts to clearing
- revegetation of 0.07 ha with overstorey and understorey species representative of the Guildford complex.

An 0.38 ha area within Lot 232 Cockram Street (Reserve 4486) was selected to be revegetated to meet the following completion criteria:

- weed cover of ≤ 10 % across the site by the end of the monitoring period, with weeds being managed to abate impact on native species survival
- no woody weeds to be present on site
- species diversity is to be at least 70 % (24 species) of the original species list by the end of the monitoring period
- no Weeds of National Significance (WoNS) or declared pest species present within rehabilitation site
- native species density is 1 plant per m^2
- native tree species density is 1 plant per 30 m^2 within upper story planting area
- no erosion as a result of construction and associated activities to be observed within the revegetation area.

Contents

1.0 Introduction

Natural Area Consulting Management Services (Natural Area) was contracted by the Shire of Serpentine-Jarrahdale (the Shire) to prepare an offset revegetation plan to satisfy requirements from the Department of Water and Environmental Regulation (DWER) for the required offset works within Lot 232 Cockram Street, Mundaring (Reserve 4486) associated with the Shire's clearing application CPS 8908/2.

1.1 Location

The proposed revegetation site is approximately 40 km south-east of the Perth CBD and is located within Lot 232 Cockram Street (Reserve 4486), Mundijong (Figure 1). The site boundary encapsulates a recreational area of degraded vegetation and decommissioned tennis courts to the west of Mundijong oval.

1.2 Scope

The main objective of the revegetation plan is to restore and revegetate the bushland and decommissioned tennis courts to a level of vegetation condition and composition which complements the surrounding area consistent with the Guildford complex. This revegetation plan will:

- provide relevant background information
- outline revegetation commitments
- describe reference sites
- describe revegetation activities and methodology
- outline revegetation objectives and completion criteria
- describe contingency plans if completion criteria are not met
- outline weed and pest control activities
- outline monitoring and reporting requirements
- provide indicative implementation schedule and budget
- describe project limitations and potential issues.

To offset clearing associated with CPS 8908/2, the Shire has committed to the following:

- planting of 33 native trees that are preferred foraging species for black cockatoos.
- revegetation of a 0.38 ha area with overstorey and understorey species in an extensively cleared landscape to mitigate impacts to clearing within an extensively cleared landscape.
- revegetation of a 0.07 ha area with overstorey and understorey species representative of the Guildford Complex.

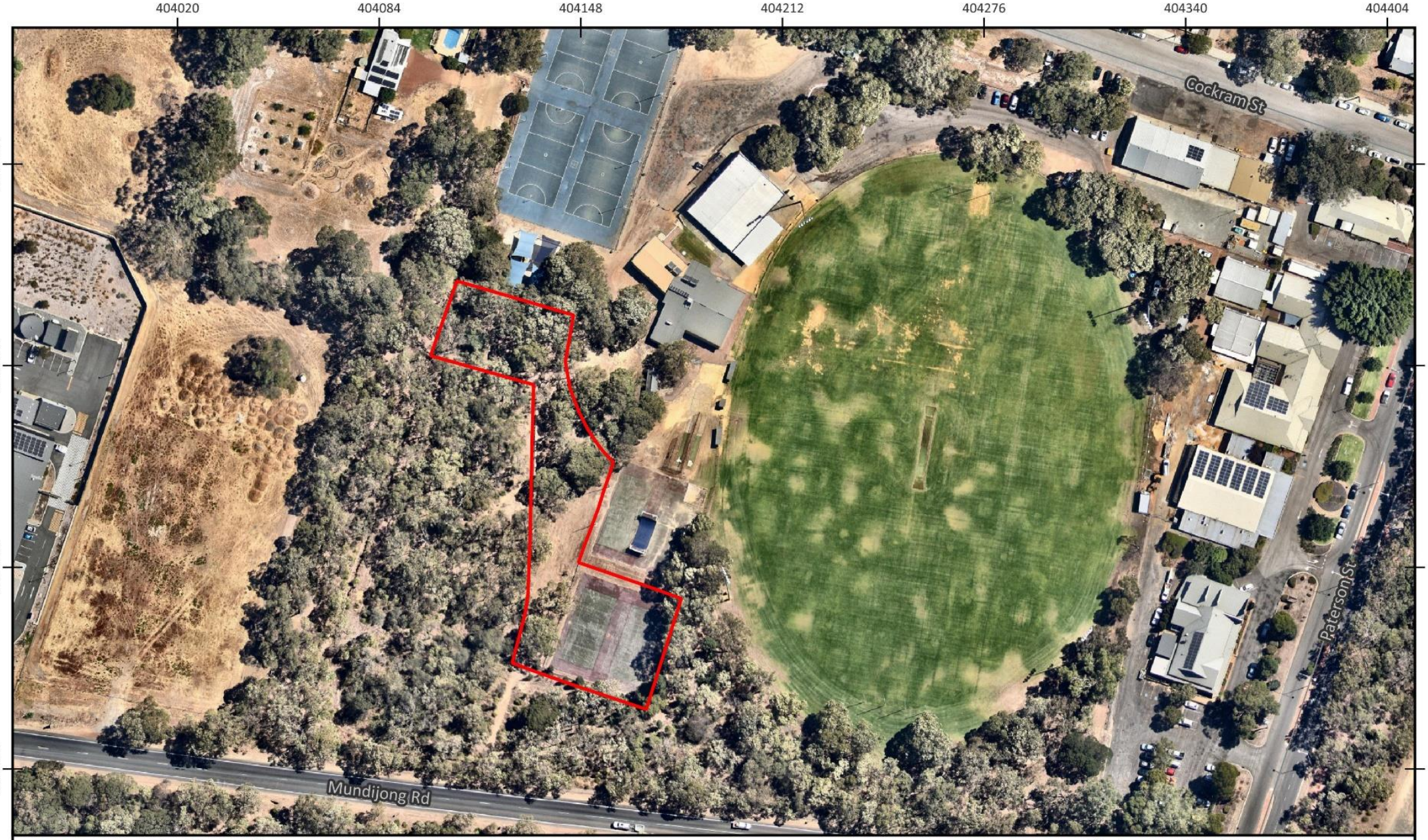

Figure 1:
Site Location

Mundijong Rd, Mundijong

Legend

Site Boundary

Client:	Shire of Serpentine-Jarrahdale
Date:	13/03/2024
Created by:	L. Carameli
Image Source:	Nearmap, 2024
Datum:	GDA2020 / MGA zone 50
Scale:	1: 1600

0 25 50 m

N

2.0 General Site Condition and Characteristics

An initial site assessment was conducted on February 20, 2024, to collect information about the site conditions and species composition of the area, to enable the development of a revegetation plan that returns an 0.38 ha area of degraded to completely degraded area within Lot 232 Cockram Street, Mundijong to a condition consistent with that of the adjacent bushland. The site assessment aimed to determine:

- current condition of the revegetation site to determine areas suitable for revegetation and which species are most likely to establish
- native and introduced flora species present on site and within adjacent bushland
- assessment of infrastructure present on site.

The characteristics of a site have a strong bearing on the flora, vegetation, fauna, and ecological communities present. Site characteristics, including soils, vegetation complexes and climate, will inform the revegetation plan in the selection of suitable species. The key characteristics of the proposed revegetation site include:

- The site is located within the Swan Coastal Plain 2 (SWA02) IBRA subregion (Department of Primary Industries and Regional Development (DPIRD, 2024b). This region is a low-lying coastal plain characterised by soils comprised of sands of colluvial and aeolian origin, as well as alluvial river flats and coastal limestone. It is dominated by Banksia or Tuart vegetation types, as well as some areas of *Casuarina obesa, Melaleuca* sp. or Jarrah Woodlands (Mitchell, *et al*. 2002).
- one soil type was identified on site, being the Bassendean B2a phase (212Bs_B2a) is described as a flat to very gently undulating sandplain, with well drained bleached grey sands and an intensely coloured yellow B horizon (DPIRD, 2024b)
- the revegetation area is flat with a consistent measurement of 34 m Australian Height Datum (AHD) across the site boundary (DPRID, 2024b)
- the Guildford Complex exists within the boundary. It is described as being dominated by a mixture of an open-forest of Marri-Wandoo-Jarrah and a woodland of Wandoo with streams fringed by *Eucalyptus rudis* and *Melaleuca rhaphiophylla*. *Eucalyptus lane-poolei* is present in restricted pockets between Cardup and Keysbrook. Most of the Guildford Complex has experienced extensive logging and clearing since European settlement, with remnant species including *Banksia grandis*, *Kingia australis*, *Xanthorrhoea preissii* and species of *Hardenbergia* and *Hibbertia* (Heddle *et al.* 1980).

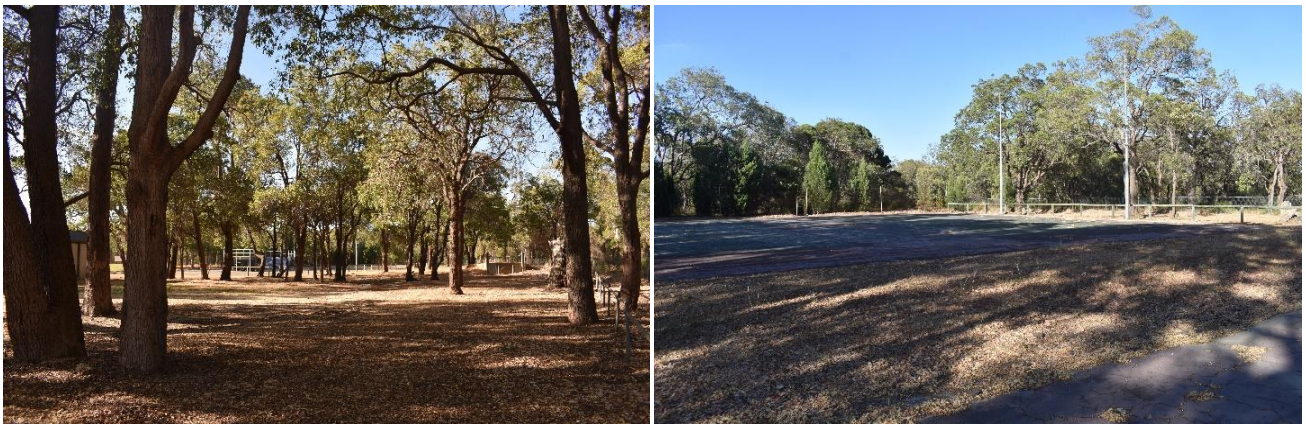

Figure 2: Site vegetation condition and infrastructure present

2.1 Climate

The climate experienced in the area is Mediterranean, with dry, hot summers and cool, wet winters. According to the Bureau of Meteorology (BoM, 2024); Karnet WA, site number 009111, the region has an average:

- Annual rainfall of 1,124.7 mm, with rain falling predominantly between May and September
- Maximum temperature ranging from 15.97 ^{o}C in winter to 29.83 ^{o}C in summer, with a maximum recorded temperature of 44.5 ^{o}C
- Minimum temperatures ranging from 7.53 ^{o}C in winter to 14.93 ^{o}C in summer, with a minimum recorded temperature of -2.0 ^{o}C
- Predominant wind directions include morning easterlies and south-westerly sea breezes in the afternoon, with an average annual wind speed of 11.8 km/h.

2.2 Other Site Characteristics

2.2.1 Environmentally Sensitive Area

The revegetation site is adjacent and within Environmentally Sensitive Area known as Bush Forever site 360 (DPRID, 2024b).

2.2.2 Hydrology

A search of online databases did not display any areas of hydrological significance within Lot 232 Cockram Street. There are two geomorphic wetlands UFI 14815 a conservation category wetland and UFI 16021 a multiple use area located within 50 m of the revegetation area (DPIRD, 2024b).

2.2.3 Heritage Values

No known European or Aboriginal heritage sites exist within the survey site (Department of Planning, Lands and Heritage (DPLH), 2024; Government of Western Australia, 2024).

3.0 Reference Site and Species Selection

To inform the revegetation process of species that are more likely to be successful and representative of historical vegetation within the area a reference site will be used. Bush Forever Site 360 (R4486, R23793, R23012), is a protected area of remnant vegetation along Mundijong Road, extending from Duckpond Road in the east to Watkins Road in the west (Government of Western Australia, 2000a, 2000b). Ten 10 x 10 m reference plots are set out along Bush Forever site 360, which aim to best represent the typical flora and plant communities of this area (Urban Bushland Council WA Inc, 2024).

These reference plots are all contained within the Guildford Complex and can therefore be used to revegetate an area representative of this complex. The list of native species recorded in these reference plots have been assessed for suitability of use for the Mundijong Rd revegetation works and are provided in Table 1. Many of the species listed are not suited for installation during the first years of revegetation due to their sensitivity to exposed conditions or potential grazing. Additionally, species which are considered difficult to produce or 'recalcitrant' have also been excluded to allow for a stronger focus on establishing framework species, while still maintaining suitable diversity and ecological function.

Table 1: Reference site species list

Family	Species	Common Name
Amaranthaceae	*Ptilotus drummondii*	Narrowleaf Mulla Mulla
Asparagaceae	*Laxmannia ramosa subsp. ramosa*	Branching Lily
Asparagaceae	*Laxmannia squarrosa*	Paper Lily
Asparagaceae	*Lomandra caespitosa*	Tufted Mat Rush
Asparagaceae	*Lomandra micrantha subsp. micrantha*	Small-flower Mat Rush
Asparagaceae	*Lomandra suaveolens*	
Campanulaceae	*Lobelia tenuior*	Slender Lobelia
Casuarinaceae	*Allocasuarina humilis*	Dwarf Sheoak
Casuarinaceae	*Allocasuarina microstachya*	
Celastraceae	*Tripterococcus brunonis*	Winged Stackhousia
Colchicaceae	*Burchardia congesta*	Milkmaids
Colchicaceae	*Burchardia multiflora*	Dwarf Burchardia
Cyperaceae	*Mesomelaena tetragona*	Semaphore Sedge
Cyperaceae	*Schoenus bifidus*	
Dasypogonaceae	*Kingia australis*	Kingia
Dilleniaceae	*Hibbertia acerosa*	Needle Leaved Guinea Flower
Dilleniaceae	*Hibbertia commutata*	
Dilleniaceae	*Hibbertia hypericoides*	Yellow Buttercups

Family	Species	Common Name
Fabaceae	*Acacia stenoptera*	Narrow Winged Wattle
Fabaceae	*Daviesia physodes*	
Fabaceae	*Jacksonia sternbergiana*	Stinkwood
Fabaceae	*Kennedia stirlingii*	Bushy Kennedia
Fabaceae	*Viminaria juncea*	Swishbush
Goodeniaceae	*Dampiera alata*	Winged-stem Dampiera
Goodeniaceae	*Dampiera linearis*	Common Dampiera
Goodeniaceae	*Goodenia coerulea*	
Goodeniaceae	*Lechenaultia biloba*	Blue Leschenaultia
Goodeniaceae	*Scaevola lanceolata*	Long-leaved Scaevola
Haemodoraceae	*Conostylis aculeata*	Prickly Conostylis
Haemodoraceae	*Anigozanthos viridis subsp. viridis*	
Hemerocallidaceae	*Caesia micrantha*	Pale Grass-lily
Hemerocallidaceae	*Chamaescilla corymbosa var. corymbosa*	
Hemerocallidaceae	*Dianella revoluta var. divaricata*	Flax Lily
Hemerocallidaceae	*Tricoryne elatior*	Yellow Autumn Lily
Hemerocallidaceae	*Tricoryne humilis*	
Iridaceae	*Patersonia occidentalis*	Purple Flag
Loranthaceae	*Nuytsia floribunda*	Christmas Tree
Myrtaceae	*Babingtonia camphorosmae*	
Myrtaceae	*Calothamnus hirsutus*	
Myrtaceae	*Hypocalymma angustifolium*	White Myrtle
Myrtaceae	*Kunzea micrantha subsp. micrantha*	
Myrtaceae	*Kunzea recurva*	
Myrtaceae	*Melaleuca lateritia*	Robin Redbreast Bush
Myrtaceae	*Melaleuca pauciflora*	
Myrtaceae	*Melaleuca viminea subsp. viminea*	
Myrtaceae	*Pericalymma ellipticum*	Swamp Teatree
Myrtaceae	*Regelia ciliata*	
Myrtaceae	*Verticordia acerosa var. preissii*	
Myrtaceae	*Verticordia densiflora*	Compacted Featherflower
Myrtaceae	*Verticordia pennigera*	

Family	Species	Common Name
Myrtaceae	*Verticordia plumosa var. brachyphylla*	
Myrtaceae	*Corymbia calophylla*	Marri
Phyllanthaceae	*Lysiandra calycina*	False Boronia
Poaceae	*Amphipogon turbinatus*	
Poaceae	*Amphipogon debilis*	
Proteaceae	*Grevillea bipinnatifida*	Fuchsia Grevillea
Proteaceae	*Grevillea pilulifera*	Woolly-flowered Grevillea
Proteaceae	*Hakea ceratophylla*	Horned Leaf Hakea
Proteaceae	*Hakea incrassata*	Marble Hakea
Proteaceae	*Hakea marginata*	
Proteaceae	*Hakea prostrata*	Harsh Hakea
Proteaceae	*Hakea trifurcata*	Two-leaf Hakea
Proteaceae	*Hakea varia*	Variable-leaved Hakea
Proteaceae	*Petrophile seminuda*	
Proteaceae	*Petrophile squamata*	
Restionaceae	*Desmocladus fasciculatus*	
Restionaceae	*Desmocladus flexuosus*	
Restionaceae	*Hypolaena exsulca*	
Rubiaceae	*Opercularia vaginata*	Dog Weed
Rutaceae	*Philotheca spicata*	Pepper and Salt
Xanthorrhoeaceae	*Xanthorrhoea preissii*	Grass tree

4.0 Completion Criteria

Monitoring activities will assess the success of the revegetation works by comparing the outcomes of monitoring to the completion criteria. The following completion criteria are to be achieved by the final monitoring event:

- weed cover of ≤ 10 % across the site by the end of the monitoring period, with weeds being managed to abate impact on native species survival
- no woody weeds to be present on site
- species diversity is to be at least 70 % (24 species) of the original species list by the end of the monitoring period
- no Weeds of National Significance (WoNS) or declared pest species present within rehabilitation site
- native species density is 1 plant per m^2
- native tree species density is 1 plant per 30 m^2 within upper story planting area
- no erosion as a result of construction and associated activities to be observed within the revegetation area

Monitoring and maintenance will be conducted for a period of five years following practical completion. If tubestock seedlings are planted at the optimum time of year and watering of plants occurs during the hottest months, losses can be minimised. Additional infill planting may be required in order to achieve completion criteria which can be sourced from the initial indicative planting list in Section 5.3.1.

Although methodology has been prescribed in Section 5.0 to ensure completion criteria stated are achieved, unforeseen site conditions may impede the desired outcomes. It is important that informal monitoring during maintenance events and formal monitoring guide the progression of the revegetation. Contingency actions and adaptive management recommendations below should be implemented if completion criteria are likely to not be met. If completion criteria are not met by the end of the defined establishment period further works should be carried out to ensure the best possible outcomes for the project.

Table 2: Completion Criteria and Contingency Actions

Completion Criteria	Potential Issue	Contingency Actions
Weed cover <10%	Adverse weather does not allow for weed control to occur on time	▪ Implement weed control as weather permits ▪ Implement manual weed control to reduce weed burden until chemical weed control can be undertaken
	Unseasonal weather patterns promote multiple weed germination events increasing weed burden	▪ Implement additional weed control events
No woody weeds present on site	Woody weeds present	▪ Implement targeted weed control
	Plants suffer from harsh summer period and show	▪ Consider watering of tubestock

Completion Criteria	Potential Issue	Contingency Actions
Species diversity to be at least 70% (24 species) of original species list	signs of heat and water stress	▪ Increase infill numbers in subsequent years ▪ Assess what plant species are struggling in the environment and adjust planting list
	Animal grazing of tubestock	▪ Installation of additional tree guards to protect plants
No WoNS or Declared Pest Species present within rehabilitation site	WoNS or Declared pest found on site	▪ Conduct targeted weed control to remove species
Native species to be a density of 1 plant per m^2	Plants suffer from environmental conditions	▪ Consider additional watering events ▪ Assess infill planting numbers and species suitability ▪ Consider reasons for species decline
	Vandalism of planted area	▪ Installation of additional tree guards to protect plants and/or temporary fencing
Native tree species average density of 1 per 30 m^2 in upper story planting area	Plants suffer from environmental conditions	▪ Consider watering of tubestock ▪ Consider infill planting
	Plants damaged by pedestrians	▪ Install tree guards
No erosion present within revegetation area	Erosion causing damage to revegetation and surrounding facilities and bushland	▪ Consider undertaking erosion control works ▪ Consider infill planting of disturbed area

4.1 Monitoring

Monitoring of revegetation activities within the rehabilitation site will occur annually in Spring. Spring monitoring events will allow assessment of plants which are likely to persist through the drier months and will allow enough time to place plant orders to meet any infill requirements. General project management assessment will be utilised to ensure detrimental factors affecting the revegetation is managed.

Monitoring will continue until the completion criteria have been met and maintained for a minimum of two years. Monitoring will consider the mix of other native species and use this information to guide species choice for infill planting activities. Monitoring will also include an assessment of weeds present and signs of pest animal species. Example monitoring record sheets have been provided in Appendix 1.

Monitoring will include:

- one fixed photo monitoring point to be set up to enable comparison of the area over time
- two fixed 10 m x 10 m quadrats will be set up across the offset site, with plant survival, vegetation health, community structure and any other relevant observations being noted, photos taken from the north western corner of each quadrat
- general assessment of the entire site considering maintenance issues, identification of potential success inhibiting factors, fauna presences and other relevant information

- assessment of vegetation structure
- assessment of weed coverage
- assessment of offset area for presence of WoNs or declared pests.

4.2 Reporting

A post implementation report will be supplied to the Shire following initial implementation works. The report will provide the following details:

- final species selection and installation numbers
- photos of works being conducted
- limitations and observations noted during implementation activities.

An annual report will be provided to the Shire describing:

- ongoing weed control
- revegetation activities carried out
- survival rates, including progress towards completion criteria
- recommendations on infill planting and suggested species
- recommendations on the need for pest animal control.

This document will contribute to reporting requirements associated with approval conditions in the clearing permit issued to the Shire.

4.3 Limitations

Several project specific limitations are present which could limit the rehabilitation of the site. The following limitations have been considered during the planning stage of this project (Table 3). Limitations and potential issues should be assessed throughout the project during maintenance and monitoring events. At this time the Shire should be made aware of any issues and the project should be driven by adaptive management throughout the project.

Table 3: Potential limitations and considerations

Potential Limitations/Issues	Considerations
Damage from trampling/ vandalism of revegetation site	Tree guards to be installed to restrict access by pedestrians
	Fence line to be installed surrounding revegetation area
Persistent occurrence of weeds due to high weed presence and large soil seed bank.	Regular scheduled weed control events to occur for 24 months to allow establishment of revegetation
Climatic conditions, drought and bushfires my limit the completion criteria	Ongoing maintenance including watering of site may be required
	Infill plant installation in subsequent years if greater than 30% losses from heat stress
Herbivory from rabbits causing damage to native vegetation	Tree guard installation
	Tubestock to be hardened off before dispatch to provide less palatable foraging

5.0 Revegetation Methodology

Rehabilitation will primarily involve weed control, seed collection and plant installation to restore the vegetation structure. Rehabilitation methodology is discussed in the following sections.

5.1 Site Preparation

The proposed site for revegetation is a recreational area that consists of degraded to completely degraded vegetation, with an upper story of *Corymbia calophylla* (Marri). Recreational infrastructure is present on site, including pine bollards, tennis courts, and defunct light poles. This infrastructure is to be removed by the Shire. No construction rubble generated during site preparation is to remain on site and ripped ground should be levelled to ensure no erosion or pooling of water during winter months. Care should be taken when using machinery to avoid any damage to surrounding vegetation. Soil within the upper storey planting area (Figure 4) is to be mechanically ripped to a depth of a 0.5 m in preparation of tubestock installation (Figure 3). Soil is not to ripped within the trees structural root zone (SRZ). The SRZ can be calculated using the equation *SRZ = (DRC x 50) 0.42 x .064* where DRC is the trunk diameter above the root crown measured in metres.

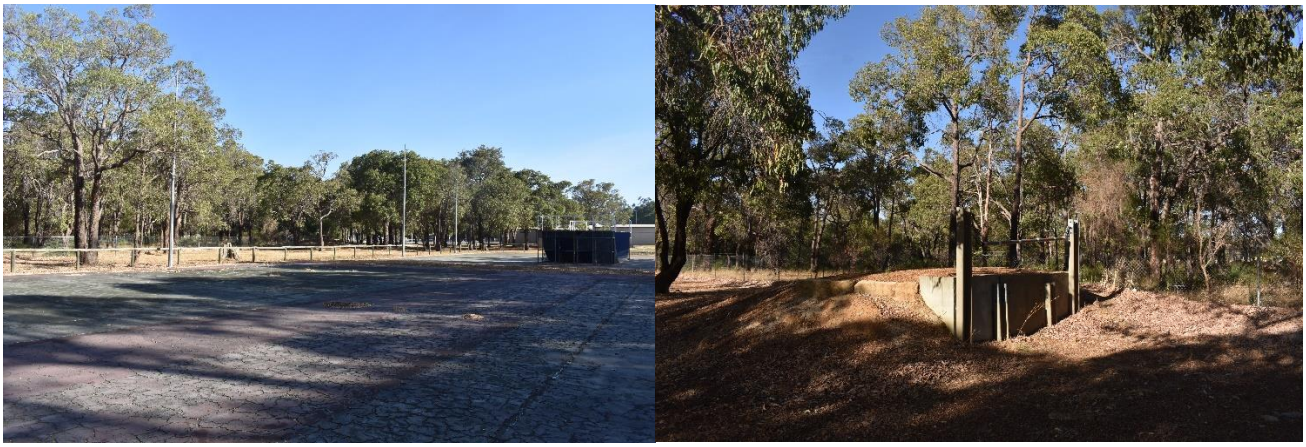

Figure 3: Infrastructure present within revegetation area

5.2 Weed Control

Weed control in the context of this plan should aim to provide a reduction in competition to establishing plants and removal of all declared pests, Weeds of National Significance (WoNS) and woody weeds from the revegetation area. Declared pests are listed on the Western Australian Organism List (WAOL) under the *Biosecurity and Agriculture Management Act 2007* (WA) (DPIRD, 2024c). This classification requires the landowner/land manager to control the population to limit damage as a result of the presence of these species (DPIRD, 2024a).

Weed species observed on site and within the adjacent bushland provide an indication of potential weed species that may affect revegetation efforts. The site visit occurred in summer when weed coverage is at its lowest, therefore weed coverage and diversity of species is expected to increase in seasons with increased rainfall. It is also expected that disturbances of the soil through site preparation of ripping and removal of infrastructure will increase weed load by disturbing the buried seed bank and increasing conditions for

germination. Characteristics of a particular weed species determine the most appropriate type of weed control method/s and can be found on the FloraBase website (Western Australian (WA) Herbarium, 1998-). Example weed treatments for different species are described in Table 4. A list of the introduced species observed in the revegetation site and adjacent native vegetation is provided in Table 5. Invasiveness and impact ratings, and treatment options are also provided. It is important that weeds be managed prior to seed setting and are not allowed to get to a size and density which may impact revegetation.

Weed control works should be undertaken both pre and post planting activities and may include:

- slashing of grasses
- woody weed treatment and removal
- herbicide application prior to initial planting to keep weed cover low and ensure successful germination/establishment rates and reduce the seed load in the seed bank within the soil
- maintenance spot spray weed treatments following initial revegetation works, to be undertaken at 8-week intervals or as required for a minimum of two years following completion of revegetation
- manual weed control should be conducted where required to ensure zero off target damage ensuring no risk of seed dispersal and no risk of chemical entering the waterway.

The proposed implementation schedule for weed control is provided in Section 6.

Table 4: Weed treatment types, target species and methodology

Treatment Number	Treatment Type	Targeted Species	Application Method and Comments
1	Non-selective (Glyphosate)	Annual and perennial grass and broadleaf weeds	Spot spray target species
2	Grass selective (e.g., Fusilade)	Annual and perennial grasses	Spot spray - selective grass spray (will affect native grass species)
3	Selective (Metsulfuron)	Annual broadleaf weeds and bulbs	Spot spray – semi selective
4	Wick wipe non-selective (Glyphosate wipe) or spot spray selective (Metsulfuron)	One-leaf Cape Tulip	Wipe leaves with sponge prior to or just on flowering
5	Woody weeds (Triclopyr, or Glyphosate)	Woody weeds and trees	Cut and paint, basal bark or drill and fill. (Method is species dependant as some are prone to suckering e.g., *Schinus terebinthifolia*)
6	Manual removal/hand weeding	Carnation weeds (*Euphorbia* sp.), Fleabane (*Erigeron* sp.) and other similar species including woody weed seedlings when small	Gloves required due to caustic sap of Carnation Weeds

Treatment Number	Treatment Type	Targeted Species	Application Method and Comments
7	Selective (Triasulfuron)	Carnation weeds (*Euphorbia* sp.), Brassicaceae weeds post emergence and other annual species	Spot spray – selective
8	Non-selective (Glyphosate) and selective (Metsulfuron)	Black Flag (*Ferraria crispa*)	Spot spray when flowering, may take several years to control populations

(Source: Brown and Brooks, 2002; WA Herbarium, 1998-)

Metsulfuron and other Group B herbicide applications (if used) should occur once a year at the recommended rate to reduce the potential for residual effect in soils, which can lead to some species becoming resistant and associated death of non-target species. Herbicide application should always be conducted by licensed personnel and occur as per best treatment methodologies and as per the manufacturer's usage and safety specifications as detailed on labels and Safety Data Sheets (SDS). Herbicide application works can enable the targeting and treatment of several species during the same management event, reducing the number of events.

Table 5: Impact, invasiveness, and treatment types and timing for species found on and adjacent to site (DP/WONS highlighted red)

Family	Scientific Name	Common Name	Impact	Invasiveness	Treatment (Table 2)	Optimal Timing (Herbicide)
Fabaceae	**Acacia iteaphylla*		H	R	5 or 6	Mar-Jul
Fabaceae	**Acacia longifolia*		H	R	5 or 6	Mar-Aug
Poaceae	**Avena barbata*	Bearded Oat	H	R	1, 2 or 6	Jul-Oct
Poaceae	**Briza maxima*	Blowfly Grass	U	R	1, 2 or 6	Jul-Aug
Poaceae	**Briza minor*	Shivery Grass	U	R	1, 2 or 6	Jul-Sep
Poaceae	**Cynodon dactylon*	Couch	H	R	1 or 2	Nov-Feb
Asteraceae	**Dittrichia graveolens*	Stinkwort	M	R	1 or 6	Nov-Dec
Poaceae	**Ehrharta calycina*	Perennial Veldt Grass	H	R	1 or 2	Jun-Aug
Poaceae	**Eragrostis curvula*	African Lovegrass	H	R	1	Nov-May
Asteraceae	**Erigeron bonariensis*		L	M	1 or 6	Jun-Sep
Iridaceae	**Gladiolus caryophyllaceus*	Wild Gladiolus	H	R	1, 4 or 6	Jul-Sep
Apocynaceae	**Gomphocarpus fruticosus*	Narrowleaf Cottonbush	H	R	1, 5 or 6	Sep-Dec
Myrtaceae	**Melaleuca quinquenervia*		U	U	5 or 6	Jan-Dec
Arecaceae	**Phoenix dactylifera*	Date Palm	U	U	5	Jan-Dec

Family	Scientific Name	Common Name	Impact	Invasiveness	Treatment (Table 2)	Optimal Timing (Herbicide)
Fabaceae	**Trifolium arvense*	Hare's Foot Clover	U	U	1	Jul-Sep
Poaceae	**Vulpia sp.*		H	R	1	Jul-Aug
Iridaceae	**Watsonia meriana*	Bulbil Watsonia	H	R	4 or 6	Sep

5.3 Revegetation

Revegetation activities will involve planting and seed collection at the site to restore the lower storey, middle storey, and upper storey vegetation structure. Prior to clearing activities relating to CPS 8908/2, seed should be salvaged and used in revegetation works (if present). Retention of potential habitat logs from felled trees should be considered where feasible. Revegetation methodology is discussed in the following sections.

5.3.1 Species and Sourcing

An indicative species list for revegetation is provided in Table 6, which has been created based on common species found in nearby reference areas and representative of the Guildford Complex. The aim of the flora species list is to provide an indication of species that could be included within the restoration process, with the actual list being informed by seed that has been collected to provide the tubestock for the project and those available from the nursery (or nurseries) contracted.

Plants to be used in revegetation activities should be installed as tubestock with avoidance of plants within small cell trays as these often have less extensive root systems and may take longer to establish. Species strata selection is to occur at a rate of 1 (Upper): 20 (Middle): 75 (Lower), in order to achieve a similar structure to the target vegetation structure.

Table 6: Indicative species list and plant numbers for revegetation

Species	Common Name	CPS 8908/2 approved plant list	Planting Numbers
Lower Strata (<1m)			
Acacia stenoptera	Narrow Winged Wattle		
Acacia willdenowiana	Grass Wattle	x	
Anigozanthos viridis subsp. viridis			
Babingtonia camphorosmae	Camphor Myrtle	x	
Billardiera fraseri	Elegant Pronaya	x	3000
Bossiaea eriocarpa	Common Brown Pea	x	
Dianella revoluta	Flax Lily		
Gompholobium marginatum		x	
Goodenia coerulea		x	

Species	Common Name	CPS 8908/2 approved plant list	Planting Numbers
Hakea ceratophylla	Horned Leaf Hakea	x	
Hibbertia hypericoides	Yellow Buttercups	x	
Kennedia prostrata	Scarlet Runner	x	
Patersonia occidentalis	Purple Flag		
Synaphea petiolaris	Synaphea	x	
Middle Strata (1-6m)			
Acacia pulchella	Prickly Moses	x	
Allocasuarina humilis	Dwarf Sheoak		
Banksia nivea	Honeypot Dryandra	x	
Calothamnus hirsutus			
Daviesia physodes			
Hakea prostrata	Harsh Hakea		
Hakea trifurcata	Two-leaf Hakea		
Hakea varia	Variable-leaved Hakea		
Hypocalymma angustifolium	White Myrtle	x	800
Jacksonia furcellata	Grey Stinkwood		
Jacksonia sternbergiana	Stinkwood		
Kingia australis	Kingia	x	
Melaleuca lateritia	Robin Redbreast Bush		
Pericalymma ellipticum	Swamp Teatree	x	
Philotheca spicata	Pepper and Salt	x	
Regelia ciliata			
Viminaria juncea	Swishbush		
Xanthorrhoea preissii	Grass tree	x	
Upper Strata (>6m)			
Corymbia calophylla	Marri		40
Eucalyptus marginata	Jarrah		
		Total	**3840**

Planting works should aim to meet the following requirements:

- sourced from a Nursery Industry Accreditation Scheme Australia (NIASA) accredited nursery to ensure hygiene and quality of plants
- only healthy true to form plants to be installed

- tubestock needs to be suited to the revegetation site growing conditions (local provenance)
- provided in forestry tubes or greater (pot size = 50 mm x 50 mm x 120 mm tall minimum)
- plants shall be vigorous, established and hardened off
- have a good form consistent with species and variety
- free from disease and pests
- have large healthy root systems with no evidence of having been restricted or damaged (e.g., root bound)
- any pruning, budding or grafting scars will be clean and well calloused
- stock will be able to support their own weight, i.e., stand without staking
- containers will be free of weeds
- the root ball of the plant shall remain intact with only a minor amount of loose soil present.

5.3.2 Seed Collection

An experienced revegetation seed collection consultant will be engaged to conduct seed collection throughout the remnant bushland and adjacent reserves (within the Shire of Serpentine-Jarrahdale) to provide provenance specific seed which will produce a similar vegetation representation from the immediate area. Seed collectors will be licenced, and Revegetation Industry Association of Western Australia (RIAWA) accredited. All seed will be handled under RIAWA standards.

Seed will be collected as soon as practicable or within the 2024 to 2025 seed collection season (November to March) to begin propagation in 2025. Collection events will need to obtain enough seed to produce 3840 stems for installation in 2026. Seed collectors should ideally be the same contractor implementing the works and/or propagation of the plants to ensure continuity of quality and accountability of supplied stock. Seed will be collected in quantities to target an initial stem count of 1 plant per metre square. Final weights will be determined by the species collected and availability. If seed collection is not feasible discussions should be had with the Shire to see availability of provenance seed for propagation of tubestock.

5.3.3 Tubestock Installation

Installation of plants should coincide with winter rains, typically between June to August. Plants are to be installed by suitably experienced personnel, ensuring that the tubestock root ball is covered by soil.

The target density for tubestock revegetation is 1 plant per metre square for lower to middle storey species across the site and 0.05 plants per metre square for upper storey species within the upper story planting area. Successful revegetation will include a suitably diverse mix of upper, middle, and lower storey species where applicable. Planting of middle and lower storey species will occur in a random pattern across the area to be revegetated rather than in clumps of the same species.

Installation of upper story species is recommended to occur within the area outlined in Figure 4. This area does not currently contain an upper story canopy. Concentrating upper story species within this area will enclose the canopy better connecting the existing vegetation.

To ensure that species density and diversity is established, it is recommended that infill planting of approximately 30% of tubestock is to be installed in subsequent years. However, species selection and infill plant numbers will be finalised depending on the establishment rates of revegetation tubestock plantings.

An infill planting list can be generated based on the results of the monitoring events and original species list. Establishment can be dependent on climatic conditions and other impacts such as herbivory and/or humans.

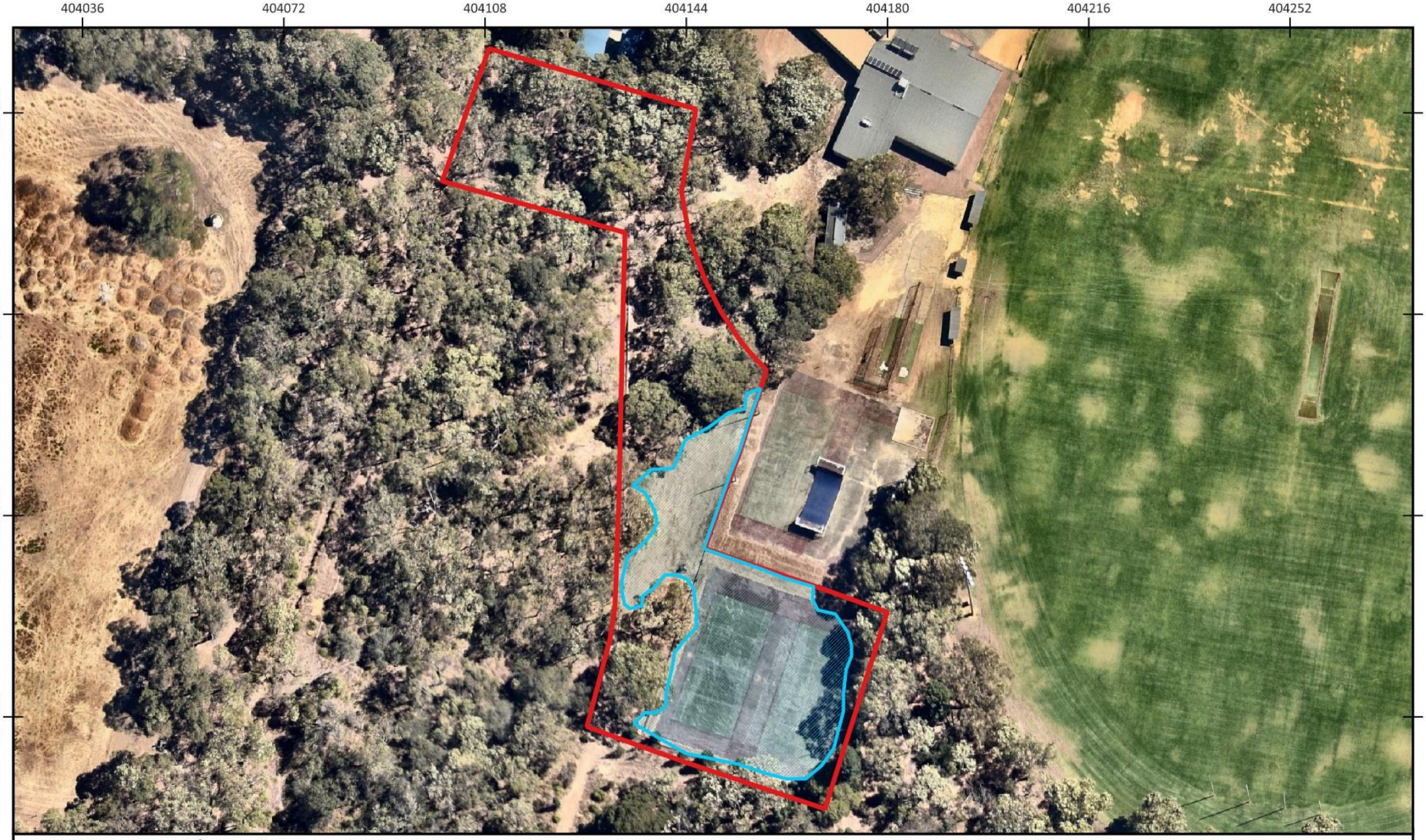

Figure 4:
Upper Story Planting Area

Mundijong Rd, Mundijong

Legend

Upper Story Planting Area

Client:	Shire of Serpentine-Jarrahdale
Date:	26/03/2024
Created by:	L. Carameli
Image Source:	Nearmap, 2024
Datum:	GDA2020 / MGA zone 50
Scale:	1: 900

0 25 50 m

N

5.4 Maintenance Activities

Ongoing maintenance for a minimum of five years following revegetation will be required to meet the completion criteria and should be based on the outcomes from the revegetation monitoring and observations on site. Maintenance should be carried out by environmental specialists with experience in adaptive management and identifying threats and opportunities to revegetation outcomes. Maintenance tasks include:

- regular weed control events including woody weed treatment and removal
- rubbish collection (on an as-needed basis)
- removal of tree guards once plants have become established (if required)
- monthly watering (including wetting agent) at rate of 2L per plant per watering event during warmer months (November to March) for a minimum of the first year of establishment. Additional watering events to be carried out if required.
- fence repairs (if required)
- erosion control (if required)
- infill planting (if required).

When works are being carried out environmental specialists should take note of any disturbances such as erosion, dumping of large household items and report then to the Shire as soon as practicable. All maintenance activities should be recorded and outlined in an annual report with monitoring outcomes.

6.0 Implementation Schedule

An indicative implementation schedule (Tables 7-8) has been provided below, based on best practice timing to undertake revegetation activities.

Table 7: Indicative implementation schedule 2024-2025

Item	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Site Preparation and Initial Works														
Removal of existing infrastructure														
Seed Collection														
Procurement of Tubestock														

Table 8: Indicative maintenance schedule 2026-2031

Item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maintenance 2026												
Ripping of site												
Initial Weed Control												
Tubestock installation												
Maintenance event												
Monitoring and reporting												
Procurement of infill plants (If required)												
Watering												
Maintenance 2027												
Maintenance event												
Infill planting (if required)												

Item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Watering												
Monitoring and Reporting												
Procurement of infill plants (If required)												
Maintenance 2028												
Maintenance event												
Infill planting (if required)												
Monitoring and reporting												
Maintenance 2029												
Maintenance event												
Monitoring and reporting												
Maintenance 2030												
Maintenance event												
Monitoring and reporting												
Maintenance 2031												
Maintenance event												
Monitoring												
Final report												

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Appendix 1: Sample Monitoring Record Sheets

General Site Information

Site:	
Date:	
Assessors:	
Weather Conditions:	

Fauna sighted (list)

Maintenance issues present?
Describe

Potential success inhibiting factors present?
Describe

General Comments

Photo Monitoring

Photo Point	Location description	GPS location	Photo ID

Quadrat Monitoring

Site:	**Quadrat No:**
Date:	**Photo ID:**
Location Description:	**GPS:**
Native Vegetation	**Weeds**
Health (Rate 1-5; 1=Poor):	**Health (Rate 1-5; 1=Poor):**
Native Abundance (% Cover):	**Weed Abundance (% Cover):**
% Survival:	
Comments/Recommendations:	

Native Species Present		**Weed Species Present**	
Species	**No:**	**Species**	**No:**
Total:		**Total:**	
Species Diversity:		**Species Diversity:**	