

Management Plan

Lot 564 Scrivener Road Serpentine

A proposed Conservation Zone property in the Shire of Serpentine-Jarrahdale,
Western Australia



Management Plan
prepared under Clause 5.14.6 (b)
of the Shire of Serpentine-Jarrahdale
Town Planning Scheme No. 2.

Acknowledgements

The author, Andrew Del Marco of Ironbark Environmental acknowledges the contributions and expertise of Chris Portlock and Penny Hollick of the Serpentine-Jarrahdale Shire to this report.

Thank you also to Paul Lee for sharing his knowledge of his property.

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All reasonable efforts have been made by Ironbark Environmental to ensure the accuracy of this report's contents.

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1. Introduction

This Management Plan (the Conservation Zone Management Plan) has been prepared for the purposes of supporting rezoning of Lot 564 Scrivener Road from Rural to Conservation under the Shire of Serpentine-Jarrahdale Town Planning Scheme No. 2. A management plan is a requirement of Clause 5.14.6 (b) of TPS No. 2, and detailed in Clauses 5.14.6 (c) and (d).

The Site (Figure 1) is of high conservation significance and meets the requirements for properties to be included in Shire's Conservation Zone. The Site's conservation values are described in Section 2.

Lot 564 (the Site) is covenanted under the National Trust of Australia (WA) Conservation Covenanting Program. Conservation zoning will further protect the conservation values of the site through their recognition under the Shire's Town Planning Scheme.



Figure 1: The Site, Lot 564 Scrivener Road, Serpentine.

As part of the Conservation Covenant over the Site, a management plan (the Trust Management Plan) has been produced and endorsed by the National Trust of Australia (WA). The Trust Management Plan has the objective of protecting the native flora and fauna on the Site for the long-term future. A copy of the Trust Management Plan is included in Attachment 1.

The Trust Management Plan has been reviewed by environmental experts in the Shire's Environmental Section and Ironbark Environmental and has been found to be technically sound, thorough and adequate to protect the Site's conservation values.

Hence, this Conservation Zone Management Plan refers to, and complements, the Trust Management Plan and has been prepared to provide the necessary additional information to satisfy the requirements of TPS 2. In this way, the two management plans will be generally complementary. Where there is a conflict between the two plans, the Conservation Zone Management Plan shall prevail.

The Conservation Zone Management Plan should also be read in conjunction with the Rezoning Submission report, including the Special Provisions, which are to apply to the Site (separately bound and tabled to Council).

1.1 General site description

Lot 564 Scrivener Road Serpentine (the Site) is located on the Darling Scarp southeast of the Serpentine townsite and approximately 1.5 kilometres off the Scrivener Road/South West Highway intersection. The Site is 33.09 hectares, almost completely vegetated and surrounded by large rural properties and the Serpentine National Park to the north (Figure 2). The property is moderately to steeply undulating, with the western third offering extensive views over the coastal plain.

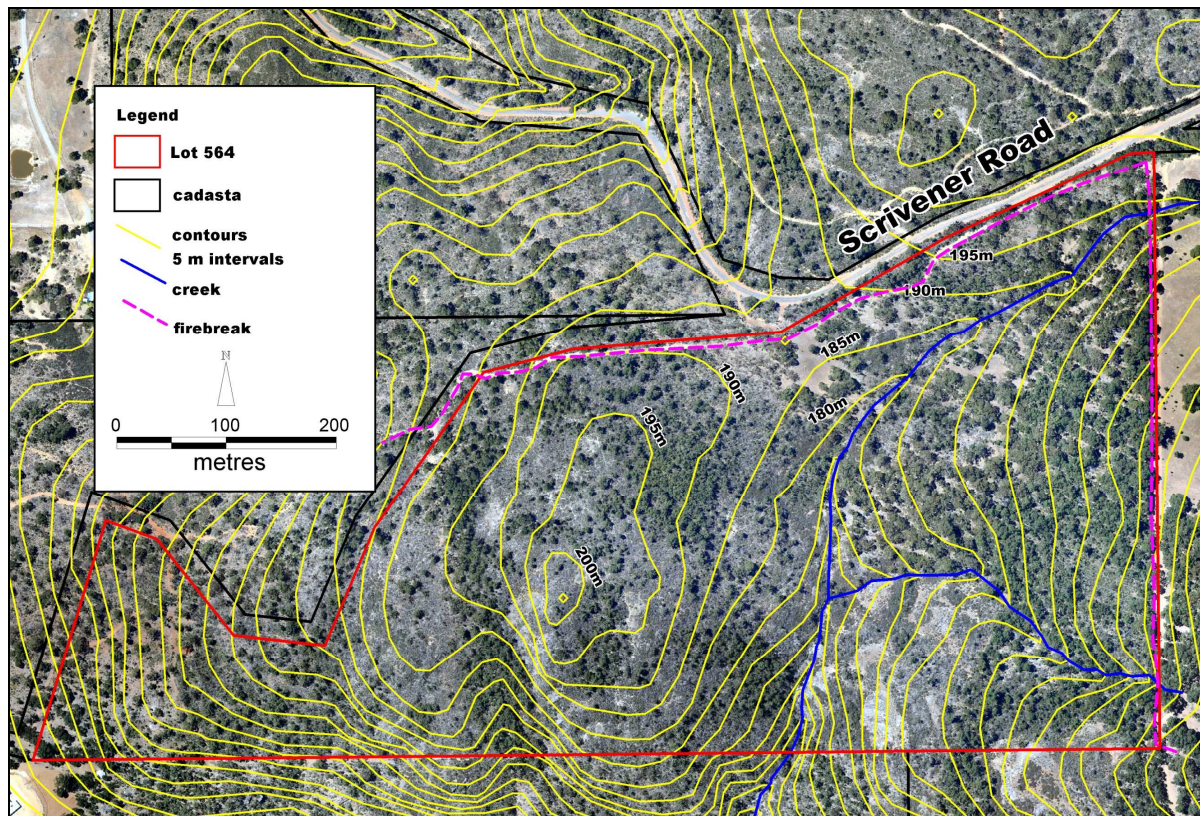


Figure 2: Site features

The Site includes the confluence of two small creeks whose headwaters are on the adjacent property to the east. Up until about 5 years ago, the main (northern) branch of the creek flowed year-round. It now ceases to flow over summer months. Given the site's underlying geology, there is no near-surface groundwater on site.

Current fire management practices on the site consist of:

- Maintenance of firebreaks; Firebreaks on the property occur on the northern and eastern boundaries. Construction of firebreaks on the southern and western boundaries is not possible given the steep grade of the site in these locations.
- Maintenance of three perimeter gates on the property to allow direct access to Scrivener Road, Lot 555 South West Highway to the west and the adjacent private lot to the east on Scrivener Road; and
- Weed control in proximity to Scrivener Road.

2. Conservation Values

The Site is acknowledged as being of high conservation significance by the Shire of Serpentine Jarrahdale Environmental Services team (Chris Portlock, pers. comm.) and meets a number of targets in the Shire's Local Biodiversity Strategy (LBS) as indicated below (Ironbark Environmental, 2008) and Healthy Habitats Program.

The Site's biodiversity conservation values include:

1. 33.2 hectares of native vegetation in good to very good condition, this being of the Darling Scarp Vegetation Complex (Target 2H of Shire's LBS);
2. Forming part of a recognised Regional Ecological Linkage (Target 3F of Shire LBS) (Western Australian Local Government Association and Perth Biodiversity Project, 2004). This means that it is important for the survival and movement of native fauna across the regional landscape;
3. Granite outcrop formations, with are naturally restricted in the Perth Metropolitan region;
4. Habitat for a number of rare and threatened fauna species protected under State and/or Federal legislation (Target 3A of Shire LBS) including:
 - a. Forest-Red-tailed Black Cockatoo (*Calyptorhynchus banksia naso*)
 - b. Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*)
 - c. Chuditch (*Dasyurus geoffroii*)
 - d. Baudin's Black Cockatoo (*Calyptorhynchus baudinii*)
 - e. Numbat (*Myrmecobius fasciatus*).
5. Habitat for restricted locally indigenous flora, namely Eucalyptus laeliae. These are designated locally characteristic species under the Local Biodiversity Strategy (Target 1A of Shire LBS).
6. Darling Scarp riparian environments, including a creek, which was permanently flowing up until the last 2 years (Target 3E of Shire LBS).

The Site's other natural asset values include:

1. Outstanding scenic and landscape values, including views from the Darling Scarp across the Swan Coastal Plain; and
2. Protection of a natural creek and water resources. Twenty-seven (27) hectares of the Site occurs within 200m of the creek.

A comprehensive flora survey of the Site has been carried out and has found 114 species of native flora (Hollick, 2011, Attachment 2). The Site shows no indication of infection with *Phytophthora* dieback.

For further information on the Site's conservation values, refer to Attachment 1.

3. Conservation Objective

The over-arching objective of this Conservation Zone Management Plan is to protect and manage the native flora and fauna on Lot 564 Scrivener Road Serpentine in perpetuity.

This objective will be achieved through:

1. The application of limits to land use, described as criteria for development in Section 5 (a requirement of Clause 5.14.6 (c) of TPS 2.);
2. Special Provisions relating to the Site, as applied through the Conservation Zone Scheme Amendment for Lot 564 Scrivener Road Serpentine; and
3. Implementation of the management actions described in Section 1 of the Trust Management Plan (Attachment 1).

Where there is a conflict between the application of the Conservation Zone Management Plan and the Trust Management Plan, the Conservation Zone Management Plan shall prevail.

4. Conservation Management Actions

Conservation management actions are the ongoing, proactive actions that are to be implemented by the landowner to maintain the Site's conservation values. These actions are to occur irrespective of the Site's development status.

Section 1 (Action Summary) of the Trust Management Plan describes these conservation management actions. They include:

VEGETATION ACTIONS

- The continual exclusion of livestock and other domestic animals from the Bushland;
- Continued collection of information on flora in the Bushland;
- Seed collection for local revegetation projects;
- Development of Seed Harvesting Plan and/or a Cut-flower Harvesting Plan if planning commercial scale harvesting;
- Ensuring good hygiene to avoid introduction and spread of dieback or other plant diseases in the Bushland;
- Harvesting of timber for personal use as firewood on the property, as per guidelines;
- Check the Bushland annually for invasive environmental weeds;
- Monitoring and controlling weed incursions;
- Explore the possibility of strengthening or extending corridors when opportunities arise.

FAUNA ACTIONS

- Continued collection of information on fauna in the Bushland;
- Monitor kangaroo grazing impacts in the Bushland and kangaroo numbers in and around the Bushland;
- Control rabbits, goats, foxes, cats, rodents and pigs, as necessary.

FIRE MANAGEMENT ACTIONS

- Maintain existing firebreaks and walk trails annually;
- Develop Fire Management and Fire Evacuation Plans.

MONITORING AND EVALUATION ACTIONS

- Annually assess each action presented in this management plan;
- Set up photo monitoring points to record changes over time.

These actions are regarded by environmental experts in the Shire's Environmental Section and Ironbark Environmental as appropriate and sufficient to pro-actively protect and manage the Site's conservation values.

5. Development control and assessment

In accordance with Clause 5.14.6 (c), this management plan sets out criteria that any proposed development on the site will have to satisfy. These criteria have been developed in consideration of the Site's conservation values (Section 2) and following site characteristics:

- Steep slopes over the western-third of the property which pose significant limitations for access and construction;
- The Site's visual amenity, especially those parts of the Site visible from South West Highway, the coastal plain, and Scrivener Road;
- The intact well vegetated nature of the Site and the related low level of weed infestations on site;
- Two small clearings on the Site, created though past land use and clearing activity,
- Extreme fire hazard over the Site;
- Firebreaks on the northern, eastern and parts of the western boundaries.

These characteristics provide significant constraints to development of the Site.

5.1 Criteria for development

The only use classes that may be permitted under the Shire's Town Planning Scheme No. 2 are on this Site are:

- Single House
- Public Utility

All other uses are prohibited.

No proposal for development or subdivision accompanies this rezoning application.

The following criteria are to be used to assess any proposed development, including clearing, on the Site under TPS 2:

1. No clearing of native vegetation shall be permitted on the Site without the permission of Council, except in accordance with the Conservation Zone Management Plan, Trust Management Plan, an approval under the Planning and Development Act, implementation of a Council-approved Fire Management Plan or any other written law.
2. There shall be a general presumption against clearing and any proposed clearing shall be kept to an absolute minimum. No clearing on the Site within the view shed of the South Western Highway or coastal plain, other than for Council-approved fire management requirements, shall be permitted.
3. Proposed development should be restricted to an 1800 m² building envelope, located in a gently sloping area which has been historically cleared, and provides direct access to Scrivener Road, shown in Figure 3. In the event that development cannot occur within this area, then an alternative development site may be selected where it would result in a lesser impact on the site's conservation values (relative to use of the original building envelope).



Figure 3: Location of the indicative building envelope on the Site.

4. Any proposed development shall be designed and constructed to meet Australian Standard 3959: Construction of buildings in bushfire prone areas.
5. The clearing of native vegetation associated with proposed development, including that to meet fire management requirements or access and servicing requirements shall be kept to a minimum, and shall be in accordance with a Fire Management Plan submitted with the Development Application and approved by Council. The Fire Management Plan shall be generally in accordance with the Planning for Bushfire Protection Guidelines (WAPC & FESA, 2010).
6. All development shall be sympathetic with the surrounding landscape amenity, the objectives of Council's Landscape Protection Policy, and designed to the requirements and satisfaction of Council.
7. All development shall be connected to an alternative wastewater treatment system as approved by Council, the Health Department of WA and the Department of Environment and Conservation.
8. All development shall be designed and constructed to reduce the risk of importing or spreading *Phytophthora* dieback and known or likely weeds.

5.1.1 Notes to assist with interpretation of criteria

- a. Clearing means clearing of native vegetation that is indigenous to the Site.
- b. The building envelope is located so as to maximise use of existing cleared land, and provide direct and easy access to Scrivener Road in the case of emergencies.
- c. *Phytophthora* dieback and known or likely weeds can be carried onto the site through the importation of sand fill or machinery with contaminated soil.

References

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Western Australian Planning Commission & Fire and Emergency Services Authority (2010) *Planning for Bush Fire Protection Guidelines Edition 2*, Government of Western Australia, Perth.

Attachment 1: National Trust Management Plan

For Lot 564 Scrivener Road, Serpentine

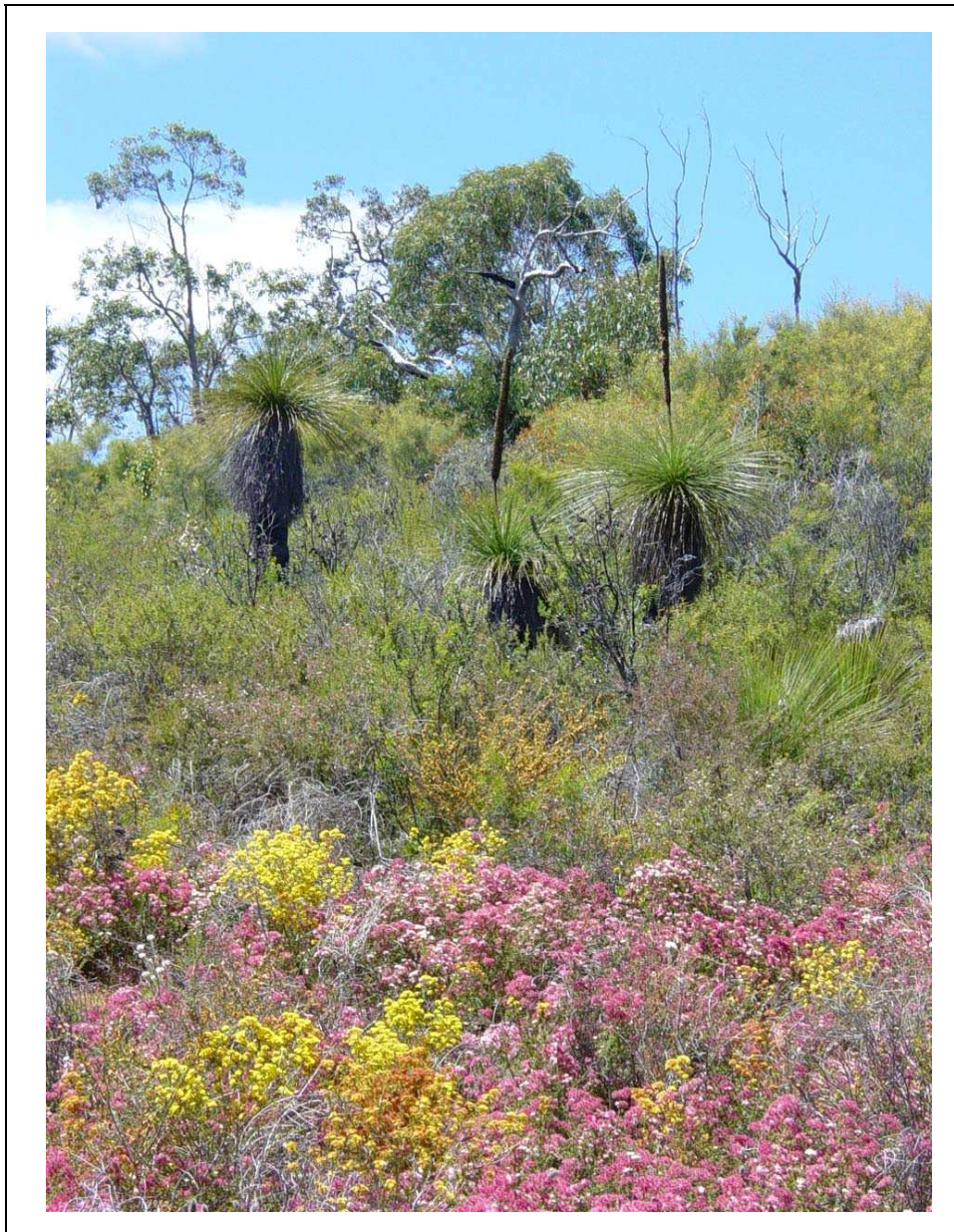
MANAGEMENT PLAN

For

Covenanted Bushland at

Lot 564 Scrivener Road

Serpentine



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1 ACTION SUMMARY

VEGETATION ACTIONS

WHAT: Continue to exclude livestock and domestic animals from the Bushland

WHO: Landholders and neighbours

WHEN: At all times

HOW: Maintain boundary fencing in a stock proof condition

VEGETATION ACTIONS

WHAT: Continue to collect information on flora

WHO: Landholders and National Trust with the assistance of special interest groups

WHEN: As the opportunity arises

HOW: Conduct flora surveys of the bushland

VEGETATION ACTIONS

WHAT: Collect seed for local revegetation projects

WHO: Landholders

WHEN: As required

HOW: Harvest in a sustainable manner by following the management guidelines (see Appendix 7) to minimise damage to the Bushland.

Develop a Seed Harvesting Plan if seed is to be harvested for commercial sale

VEGETATION ACTIONS

WHAT: Harvest cutflowers for commercial sale

WHO: Landholders

WHEN: As required

HOW: Harvest under a DEC licence and in a sustainable manner following the management guidelines (see Appendix 8), to minimise damage to the Bushland.

Develop a Cut-flower Harvesting Plan if commercial scale harvesting is planned

VEGETATION ACTIONS

WHAT: Avoid introducing and spreading dieback or other plant diseases in the Bushland

WHO: Landholders

WHEN: As all times

HOW: Ensure that good hygiene standards are maintained when working or walking in the Bushland

VEGETATION ACTIONS

WHAT: Check the Bushland for invasive environmental weeds

WHO: Landholders

WHEN: Annually, when weeds are in flower (usually in the spring)

HOW: By walking through and around the Bushland paying particular attention to areas where water flows off cleared land into the Bushland, wet areas and more open areas such as granite outcrops

VEGETATION ACTIONS

WHAT: Monitor weed incursion and control the more invasive weeds where possible

WHO: Landholders

WHEN: Annually before weeds finish flowering

HOW: Mark populations of weeds and control with careful spot applications of appropriate, approved chemicals or hand weeding (see Appendix 9 for recommended control measures)

VEGETATION ACTIONS

WHAT: Selectively harvest timber for landholders personal use as firewood on the property

WHO: Landholders

WHEN: As required

HOW: By taking only dead fallen trees without hollows and with a diameter of no greater than 20cm

VEGETATION ACTIONS

WHAT: Explore the possibility of strengthening or extending corridors

WHO: Landholders / National Trust in consultation with neighbours, Shire and local landcare group

WHEN: If the opportunity arises

HOW: Working with neighbours to identify possible corridors from aerial photography or maps.

FAUNA ACTIONS

WHAT: Collect information on fauna

WHO: Landholders and National Trust with the assistance of special interest groups

WHEN: As the opportunity arises

HOW: Conduct fauna surveys of the Bushland

FAUNA ACTIONS

WHAT: Record any new or unusual sightings of fauna

WHO: Landholders

WHEN: As noticed

HOW: Keeping sighting records in a notebook, diary or on a calendar.

FAUNA ACTIONS

WHAT: Monitor the impact of kangaroos grazing in the Bushland

WHO: Landholders National Trust can provide advice

WHEN: As time permits

HOW: Fence small areas to exclude kangaroos and take photographs of the vegetation growth within and outside the fenced areas

FAUNA ACTIONS

WHAT: Monitor kangaroo numbers in the Bushland and surrounding paddocks, and seek information on local culling programs.

WHO: Landholders/Neighbours/Licensed Shooter

WHEN: As time permits

HOW: Morning and evening observations/Spotlighting/Damage Control Licence

FAUNA ACTIONS

WHAT: Control rabbits and goats

WHO: Landholders

WHEN: As required, when time permits

HOW: By poisoning (1080), humane trapping and/or shooting

FAUNA ACTIONS

WHAT: Control foxes, cats, rodents and pigs

WHO: Landholders

WHEN: As necessary

HOW: By poisoning (1080), humane trapping and/or shooting

FIRE MANAGEMENT ACTIONS

WHAT: Maintain existing firebreaks

WHO: Landholders

WHEN: Annually before the onset of the dry season, when the fire risk is greatest

HOW: By mowing, slashing or spraying. While maintaining firebreaks - all due care needs to be taken to avoid soil disturbance and erosion

FIRE MANAGEMENT ACTIONS

WHAT: Maintain existing walk trails

WHO: Landholders

WHEN: Annually before the onset of the dry season, when fire risk is greatest

HOW: By removing fallen branches or slashing. While maintaining walk trails - all due care needs to be taken to avoid soil disturbance and erosion

FIRE MANAGEMENT ACTIONS

WHAT: Develop Fire Management and Fire Evacuation Plans

WHO: Landholders/FESA/Shire

WHEN: As soon as possible

HOW: Liaise with the local Fire Emergency Services Officer at the Shire

MONITORING ACTIONS

WHAT: Assess each action presented in this management plan

WHO: National Trust/Landholders

WHEN: Annually

HOW: Stewardship calls and property visits

MONITORING ACTIONS

WHAT: Set up photo monitoring points to record changes to Bushland landscape.

WHO: National Trust/Landholders

WHEN: As soon as possible

HOW: By taking photographs from a fixed point regularly at the same time of day and year

2 INTRODUCTION

This management plan is for 33.09-hectares, of covenanted Bushland on Cockburn Sound Location 564 (Lot 564 on Deposited Plan 126974) owned by Master T.C. Company Pty. Ltd.

Mr Paul Lee is the owner of the Master T.C. Company Pty. Ltd. And he and his family manage the Bushland as part of the overall property.

The Bushland is situated at south of Scrivener Road east of South Western Highway, Serpentine and is identified in Appendices 1 & 2.

This Bushland Owners Manual is for the duration of 6 years, from 2005 to 2011.

The management actions have been developed in consultation with the landholders and represent the responsibilities of both parties for the management of the Bushland.

In late 2010, the owners and The National Trust of Australia (WA) will meet to develop the Bushland Owners Manual for the next 6 years.

3 STATEMENT OF HERITAGE VALUE

3.1 Location and Values

Lot 564 Scrivener Road falls within the Shire of Serpentine/Jarrahdale, which still retains approximately 58.6% of its remnant vegetation, most of which is on public owned land on the Darling Range escarpment. The Shire of Serpentine contains some of the earliest recorded sites of European farming settlement in Western Australia, and many areas of bushland have been grazed and, or logged in the past. Introduced plants have escaped from pastures and gardens of the early settlers, and now pose a serious threat to the long-term viability of many areas of native bushland.

Urban development is encroaching on the area and therefore threatens the existence and long-term viability of many of the smaller isolated areas of remnant native vegetation.

In such landscapes, any larger areas of remnant vegetation in good condition, especially when connected to or adjoining other areas of protected remnant vegetation or reserves, are of great ecological value.

Comprising some 33.09 hectares; the covenanted Bushland at Lot 564 Scrivener Road is significant in a local and regional context.

The covenanted Bushland is in very good condition, with almost all of the native plant species still present that one would expect to find in undisturbed pre-European bushland.

Eucalyptus laeliae (Darling Range Ghost Gum) occurs on the property, this species has a limited distribution occurring only on the western side of the Darling Range.

Allocasuarina huegeliana (Rock Sheoak) also occurs on the property, this species is usually associated with granite outcrops in the drier wheatbelt.

An unconfirmed sighting of *Calothamnus rupestris* (Mouse-ears) has been noted on the property, this is a Priority 4 species listed by the Department of Environment and Conservation.

The bushland provides suitable habitat for many fauna species including Red and White-tail Black-cockatoos, Western Brush Wallaby and Quenda. DEC list all of these species as Priority Species. Many additional species utilise the bushland to source food, provide refuge and to nest in tree hollows.

The presence of granite outcrops and boulders, seasonal streams, dense shrublands, mature trees with hollows and fallen hollow logs adds greatly to the habitat value of the bushland.

The covenanted bushland on Lot 564 comprises almost all of the location, now protected with a covenant the bushland will be able to be enjoyed by future generations with minimal human intervention.

4 PROPERTY & OWNERSHIP DETAILS

4.1 Owner & Property Details Table

Owners Names	Master T.C. Company Pty. Ltd.		
Contact Names	Dr Paul Lee	Email: kplee@upnaway.com	
Contact Details	17 Bowman Street, South Perth, WA 6151		
	Phone: work 93679883 (surgery), home 93644262		
Property Location	Lot 564 Scrivener Road, east of South Coast Highway, Serpentine		
Property Name			
Map Reference	Zone: 50	Easting: 406,564.70	Northing: 6,416,299.50
Land Description	Lot: 564	Deposited Plan: 126974	
Title Details	Volume: 205	Folio: 43A	
Previously	Land District: Cockburn Sound	Location: 564	
Tenure (freehold / leasehold)	Freehold		
Local Government Authority	Shire of Serpentine/Jarrahdale		
Catchment Area	Serpentine River		
Size of Lot/Location	33.59ha.		
Size of Bushland (Covenanted)	33.09ha.		

4.2 Covenant Restrictions (refer to the covenant for greater detail)

√	No buildings or other structures (<i>other than those indicated in the covenant to be located within the building envelope</i>)	√	No timber removal (<i>other than for owners personal use as firewood on the land</i>)
√	No signage (<i>other than interpretive</i>)	√	No acts that would adversely affect hydrology
√	No non-indigenous flora in the bushland	√	No subdivision
√	No destruction or removal of indigenous flora (<i>except for seed collection for local revegetation projects and ecologically balanced commercial wildflower harvesting</i>)	√	No regular public access (<i>except where the owner has invited friends and special interest groups</i>)
√	No recreational trail bikes or four wheel drives (<i>except for the proper management of the bushland</i>)	√	No mining, public works, trade or industry (<i>other than the collection of rocks within an area agreed to by the Trust</i>)
√	No non-indigenous fauna in bushland	√	No act that adversely affects biota
√	No livestock in bushland	√	No rubbish dumping
		√	No guns, traps or poisons

5 MANAGEMENT OF THE BUSHLAND

5.1 Objectives

To protect the native flora and fauna for the future and from inappropriate development by:

- ❖ Continuing to excluding livestock and other domestic animals
- ❖ Gathering information on the flora
- ❖ Controlling invasive environmental weeds
- ❖ Gathering information on the fauna
- ❖ Controlling feral and problem animals
- ❖ Maintaining effective fire prevention and control measures
- ❖ Avoiding action that could contribute to soil erosion
- ❖ Monitoring change
- ❖ Monitoring and addressing threats to environmental values

5.2 Key Issues

- Control of priority weeds
- Fire protection and bushfire management
- Control of feral animals
- Avoiding unnecessary soil erosion
- Maintain dieback free status of the property

5.3 Management History

The property was originally released in 1969 and purchased by a dairy farmer, who sold it later the same year to a business manager who resided in Perth.

Paul Lee's company, the Master T.C. Company Pty. Ltd. purchased the property in 1982 and since that time the property has been used for weekend getaways by the Lee family and friends.

There are remains of a bridge over the main watercourse at the end of an overgrown vehicle track and the remains of a small hut on the south side of this watercourse. The previous owner attempted wildflower production in some of the cleared areas. This venture proved to be unsuccessful and was abandoned.

5.4 Disturbances and Impacts

Some soil has been imported onto the property to form a track and minor excavation has been undertaken in the past. However, the track is now overgrown and any minor scars in the landscape have grown over.

A previous owner constructed a small hut and bridge over the main creek; these have since fallen into disrepair and now serve only as a reminder of previous human activity on the property.

Some more serious environmental weeds were noted during site visits, mainly adjacent to Scrivener Road. These weeds will gradually spread and establish in other areas of the bushland if not controlled.

No evidence of plant disease was noted during site visits.

The property has areas of exposed granite and shallow soils over granite, this combined with steep slopes leaves the soil susceptible to water erosion if the covering native vegetation is removed by fire or other means. Maintenance of firebreaks and walk trails may result in soil erosion if not carried out with due care.

The last fire occurred on the property in 1991. This followed a fire in about 1988. The previous fire history is unknown.

Livestock have been permitted to graze on the property in the past to reduce the amount of grass in more open areas. Since livestock have been excluded, these areas have begun to regenerate slowly.

Rabbits have been noticed on the property in recent years and some soil erosion has occurred where warrens have been constructed in areas where water can flow through warrens.

Commercial wood cutting or logging has not occurred on the property for many years.

Foxes and cats are likely to occur on the property and feral pigs and goats have strayed onto the property from the neighbouring Serpentine National Park in the past. Their impact is unknown, but not obvious.

Kangaroos have increased in numbers with clearing of land for agriculture and may be overgrazing preferred species in the bushland. Their impact is unknown, but not obvious.

5.5 Geology, Landforms and Soils

The bushland is located on western edge of the Darling Plateau. The Darling Plateau comprises very ancient granitic rocks with more recent dolerite inclusions. The granitic rocks consist of granite that is banded with rocks of similar composition called gneisses and migmatites. Over most of the Darling Plateau, the basement rocks have been weathered to form surface capping of laterite.

The property slopes down to the west with distant views over the Swan Coastal Plain. It is dissected by two seasonal streams, which have cut further into the surface resulting in a series of valley slopes and scarps.

The soil types fall within the Murray Valley System, which comprises deeply incised valleys and colluvium over granite rocks. The dominant soils are friable red/brown loamy earths, brown loamy earths, loamy gravels, brown deep loamy duplexes, duplex sandy gravels and stony soils.

The upper slopes of the northern side of this undulating property consist of a gravelly red loamy soil, with surface rock pavements concealed under mosses and lichens. The soil becomes less gravelly and more clayey or loamy down slope and along the creekline. There is much exposed granite, both massive boulders and smaller rocks, at the southern side of the property. (CALM Land for Wildlife)

5.6 Water

Two winter creeks flow through the property. The creek closer to the northern boundary once flowed almost all year, but has now ceased to flow in the later summer months in recent years. The creeks add to the aesthetic and habitat value of the property. Water flows may introduce weed seeds (as noted) and riparian zones should be monitored for weeds as frequently as possible. Care should be taken if spraying near riparian zones to avoid drift onto the water and only approved chemicals should be used.

5.7 Vegetation

The property is situated on the western edge of the Jarrah Forest IBRA Region of Western Australia an area of considerable floristic diversity. There are a number of plant communities occurring in the covenanted bushland.

- Woodlands of *Corymbia calophylla* (Marri) and *Eucalyptus wandoo* (Wandoo) with areas of *Eucalyptus marginata* (Jarrah), *Eucalyptus laeliae* (Darling Range Ghost-gum), *Eucalyptus lane-poolei* (Salmon White Gum) and *Nuytsia floribunda* (W.A. Christmas Tree) over *Acacia pulchella* (Prickly Moses), *Hakea lissocarpha* (Honeybush), *Hakea prostrata* (Harsh Hakea) and *Xanthorrhoea preissii* (Balgga) over *Dryandra nivea* (Couch Honey-pot), *Kennedia prostrata* (Running Postman), *Drosera* spp. (Sundews) and *Loxocarya* sp. (Curly Grass) occupy the upper slopes.
- Shrubland with the dominant species being *Acacia*, *Hakea*, *Xanthorrhoea*, *Allocasuarina*, *Calothamnus*, *Darwinia*, *Hemigenia* and *Verticordia* occur on shallower soils over granite rock.
- Surface rock pavements with areas of native grasses, pincushions, ferns, mosses and lichens.
- Shrublands of *Baekea camhorosmae* and *Hypocalymma angustifolium* over rushes, sedges and ferns line the watercourses.
- An area of *Allocasuarina huegeliana* (Rock Sheoak) woodland also occurs on the property.

A Land for Wildlife Officer conducted a brief flora survey of the bushland during August 1998 and Emma Bramwell and Claire Hall (CALM) added to this list during a site visit in December 2002.

More recently National Trust staff have added several more species during site visits. The species recorded during these visits plus species recorded in the adjoining Serpentine National Park form the basis of the Preliminary Flora List (Appendix 3) additional species may be added as they are identified.

To date no species of rare or threatened flora, or threatened ecological communities have been confirmed in the bushland. *Eucalyptus laeliae* (Darling Range Ghost Gum) and *Eucalyptus lane-poolei* (Salmon White Gum) occur in the area, have very limited ranges and have been recorded on the property. *Allocasuarina huegeliana* (Rock Sheoak) also occurs on the property, this species is usually associated with the drier wheatbelt and only a few isolated pockets occur on the Darling Range. An unconfirmed sighting of *Calothamnus rupestris* (Mouse-ears) (**Priority 4**) has been recorded from the bushland. The following Declared Rare Flora and Priority Species are known to occur in the area, and may be occur in the covenanted bushland.

- *Tetraria australiensis* (**Rare**). Rhizomatous, tufted perennial grass-like or herb-like sedge to 1 metre tall. Brown flowers between Nov-Dec.
- *Verticordia plumosa* var. *pleiobotrya* (feather flower) (**Rare**). Dense shrub to 1 metre tall. Pink flowers between Oct-Dec. Grows on clay and sandy loam soils, in seasonally inundated swamps.
- *Lasiopetalum pterocarpum* (**Rare**). Multi-stemmed shrub
- *Drosera occidentalis* subsp. *occidentalis* (sundew) (**Priority 4**). Fibrous-rooted rosetted perennial herb to 0.01metres tall. White and pink flowers between Nov-Dec. Grows in sandy and clayey soils, in swamps and wet depressions.
- *Anthotium junciforme* (**Priority 4**). Open, erect to prostrate perennial herb to 0.4 metres tall, leave linear to terete and about 1mm wide, flowering stems 12-40cm long, blue, violet and purple flowers between Nov-Mar. Grows in sandy clay and clay soils in winter-wet areas.
- *Acacia oncinophylla* subsp. *oncinophylla* (**Priority 3**). Shrub to 2.5 metres tall, phyllodes 8-13cm long and about 2mm wide, yellow flowers between Aug-Oct. Grows on granitic soils.
- *Acacia horridula* (**Priority 3**). Harsh, slender single stemmed shrub to 0.6 metres tall, yellow flowers between May-Aug. Grows in gravelly soils over granite and in sand, on rocky hillsides.
- *Eucalyptus marginata* subsp. *elegantella* (a type of jarrah) (**Priority 2**). Tree to 15 metres tall, rough fibrous bark, white and pink flowers between Aug-Nov. Grows in grey sand and clay loam soils.

Without confirming whether threatened or endangered species occur in the bushland it is difficult to make informed decisions and take management action to protect them specifically. However, most of the management suggestions contained in this plan should aid rather than hinder their survival. It is recommended that flora surveys be conducted as the opportunity arises to record all of the species and vegetation communities present.

VEGETATION ACTIONS

WHAT: Continue to collect information on flora

WHO: Landholders and National Trust with the assistance of special interest groups

WHEN: As the opportunity arises

HOW: Conduct flora surveys of the bushland

The properties boundary is fenced and it is recommended that the fence be maintained to continue to exclude livestock run on some of the neighbouring properties at all times.

Domestic animals may stray from neighbouring properties on occasion, this may be beyond the landowners control, but should be discouraged where possible and action taken to prevent it happening again.

VEGETATION ACTIONS

WHAT: Continue to exclude livestock and domestic animals

WHO: Landholders and neighbours

WHEN: At all times

HOW: Maintain boundary fencing in a stock proof condition

Future landholders may wish to collect seeds from the bushland for use in local revegetation projects. Even careful, sustainable collection of seed from the bushland will result in a small amount of damage to the bushland, however the use of locally provenanced seed in revegetation projects far outweighs the slight amount of damage that may result. The accompanying guidelines for seed collection (see Appendix 7) should be followed to avoid minimise damage.

A licence is required if seed is to be sold and may be obtained from the DEC.

VEGETATION ACTIONS

WHAT: Collect seed for local revegetation projects

WHO: Landholders

WHEN: As required

HOW: In a sustainable manner, following the guidelines (see Appendix 8) to minimise damage to the bushland

Develop a Seed Harvesting Plan if seed is to be harvested commercially

The landholders may wish to harvest wildflowers for commercial sale at some time in the future. Harvesting of wildflowers could have a detrimental impact on the bushland if not managed carefully and an irreversible impact if plant disease is introduced through poor hygiene. Guidelines for harvesting wildflowers are attached (see Appendix 8) and should be followed to avoid unnecessary damage to the bushland.

A licence is required to harvest wildflowers for commercial sale and may be obtained from DEC.

VEGETATION ACTIONS

WHAT: Harvest cutflowers for commercial sale

WHO: Landholders

WHEN: As required

HOW: Under DCLM licence and in a sustainable manner following the guidelines (see Appendix 8), to minimise damage to the bushland

Develop a Cutflower Harvesting Plan if commercial scale harvesting is planned

VEGETATION ACTIONS

WHAT: Avoid introducing and spreading dieback or other plant diseases in the bushland

WHO: Landholders

WHEN: As all times

HOW: Ensure that good hygiene standards are maintained when working or walking in the bushland

The landholders wish to continue to remove naturally fallen timber for personal use as firewood on the property. Although timber removal is permitted under the covenant any removal of timber either standing or fallen will reduce the habitat value of bushland by reducing the number of logs in which fauna can shelter.

It is therefore recommended that logs with hollows or logs with a diameter greater than 20cm be left in the bushland as habitat for native fauna.

When timber is removed soil disturbance should be kept to a minimum to avoid providing a suitable seedbed in which weed species may establish and all machinery and equipment should be clean to avoid introducing or spreading weed seeds and plant disease in the bushland.

VEGETATION ACTIONS

WHAT: Selectively harvest timber for landholders personal use as firewood on the property

WHO: Landholders

WHEN: As required

HOW: By taking only dead fallen trees without hollows and with a diameter no greater than 20cm

5.8 Problem Plants

Plants that do not occur naturally in the bushland have the potential to regenerate and displace native species and should be considered as weeds.

Some introduced plants may never regenerate, those that do should be controlled or eradicated before they spread and become a problem that is difficult and time consuming to control. Seeds from some species, such as Eastern States Wattles, can lay dormant in the soil for 50 years or more waiting for an event such as fire or heavy, soaking rainfall to trigger germination. By the time they are a problem, there is a seed bank that will continue to germinate and become a management problem for future generations. The weed species that have the greatest potential to displace native species in the bushland should be controlled, or eradicated if possible, as a matter of priority.

The following weeds were noted in the Bushland:

- *Aira caryophylla* (Silvery Hair-grass)
- *Arctotheca calendula* (Capeweed)
- *Avena sp.* (Wild Oats)
- *Briza maxima* (Blowfly Grass)
- *Briza minor* (Shivery Grass)
- *Centaureum sp.* (Centaury)
- *Disa bracteata* (formally *Monadenia*) (South African Orchid)
- *Echium plantagineum* (Patterson's Curse)
- *Eucalyptus citriodora* (Lemon-scented Gum)
- *Eucalyptus leucoxylon* (South Australian Blue Gum)
- *Gladiolus undulata* (Wavy Gladiolus)
- *Hypochaeris sp.* (Flat Weed)
- *Lachenalia reflexa*
- *Lavandula stoechas* (French Lavender)
- *Oxalis purpurea* (Four O'clock)
- *Parentucellia latifolia* (Common Bartsia)
- *Paspalum sp.* (Paspalum)
- *Romulea rosea* (Guildford Grass)
- *Silene gallica* (French Catchfly)
- *Trifolium tomentosum* (Woolly Clover)
- *Vulpia myuros* (Rat's Tail Fescue)
- *Watsonia sp.* (Watsonia)
- *Gomphocarpus fruticosus* (Swan Plant/Narrowleaf Cotton Bush) **(DP)**

Of these weeds Watsonia, Narrowleaf Cotton Bush, French Lavender, Paterson's Curse & Wavy Gladiolus have the greatest potential to become a major problem in the bushland and their spread should be monitored if not controlled. Eradication is often possible when weeds first establish in the bushland or invade a new area of the bushland.

A more thorough survey of the bushland should be conducted to locate and mark the populations of these more serious invasive weeds. The populations should be checked annually and controlled before seed set if at all possible (for recommended control measures see Appendix 9).

Weeds have been introduced and will continue to be introduced by wind and water and on vehicles, clothing, and mammal fur, bird feathers and through viable seeds in animal droppings.

VEGETATION ACTIONS

WHAT: Check the bushland for invasive environmental weeds

WHO: Landholders

WHEN: Annually when weeds are in flower (usually in the spring)

HOW: By walking through and around the bushland paying particular attention to areas where water flows off cleared land into the bushland, wet areas and more open areas such as granite outcrops

VEGETATION ACTIONS

WHAT: Monitor weed incursion and control the more invasive weeds where possible

WHO: Landholders

WHEN: Annually before weeds finish flowering

HOW: Mark populations of weeds and control with careful spot applications of appropriate, approved chemicals or hand weeding (see Appendix 9 for recommended control measures)

5.9 Connective Corridors

Remnant bushland is often completely surrounded by cleared farmland, with the nearest areas of bushland being some distance away, limiting the movement of fauna. Bushland corridors provide for the movement of wildlife around a property and throughout the wider landscape. Corridors can also provide important buffers from agricultural and urban activities.

Corridors need to be designed for the movement of desired wildlife and therefore need to be “user friendly”.

Corridors should contain all of the levels of vegetation that would have existed prior to European settlement and in particular should contain lots of dense, prickly shrubs to provide protection for corridor users from predators. Local species should always be used as these plants have evolved as part of the local ecosystem. Often non-local species are prone to insect attack and can become weeds.

The covenanted bushland adjoins a much larger area of protected bushland to the north being Serpentine National Park (↑28862 of 635 ha.). Karnet Nature Reserve (↑32202 of 302ha.) lies a short distance away to the southeast and is connected by scattered remnant vegetation on private property that may or may not be viable and protected in the long-term.

It may be possible to strengthen, or extend, the existing corridor connections, but this has not been explored in this Management Plan.

VEGETATION ACTIONS

WHAT: Explore the possibility of strengthening or extending corridors

WHO: Landholders/ National Trust in consultation with the Shire, neighbours and local landcare group

WHEN: If the opportunity arises

HOW: By working with neighbours to identify possible corridors from aerial photography

5.10 Native Fauna

The landowner has noted the following threatened or priority species on the property:

- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*), (**Priority 3**). This subspecies of the Red-tailed Black Cockatoo is restricted to forests of the southwest.
- Carnaby's Black Cockatoo (*Calyptorhynchus latirostri*), (**Schedule 1**). Frequents proteaceous scrubs and heaths and adjacent Eucalyptus woodlands.

No thorough fauna surveys have been carried out on the property and it is not known whether any of the following species of threatened or priority fauna that are known to occur in the area occur in the bushland.

Schedule 1 (Fauna which is rare or likely to become extinct)

- Chuditch (*Dasyurus geoffroii*) - Vulnerable. Has become more common in forest areas baited for fox control. Highly mobile, occupies large home ranges. Several recent sightings nearby.
- Baudin's Black-Cockatoo (*Calyptorhynchus baudinii*) - Endangered. Largely restricted to the forested areas of the southwest. Nests in hollows of marri and wandoo and feeds on the seeds of eucalypts and various proteaceous species.
- Numbat (*Myrmecobius fasciatus*) - Vulnerable. A diurnal marsupial that feeds almost exclusively on termites and is very vulnerable to predation by foxes and cats. Require hollow logs for shelter and favour wandoo woodland. Have been sighted recently in state forest several kilometres away.

Schedule 4 (Fauna which is otherwise specially protected)

- Peregrine Falcon (*Falco peregrinus*). Occasional visitor to areas of open woodland and along margins with cleared land.

Priority Taxa

- Quenda (*Isoodon obesulus fusciventer*) (**Priority 5**). Moderately common in parts of the forest where dense understorey vegetation occurs, particularly along riverine gullies. Has become more abundant as a result of fox baiting and occurs in more open habitat where fox baiting has been implemented.
- Western Brush Wallaby (*Macropus irma*) (**Priority 4**). Occurs in areas of forest and woodland supporting a dense layer of shrubs.
- Water Rat (*Hydromys chrysogaster*) (**Priority 4**). Occurs along watercourses where there are freshwater molluscs and crustaceans (its main prey items) present.
- Carpet Python (*Morelia spilota imbricata*) (**Priority 4**). Occurs in forest and woodland where suitable tree hollows are available.
- Brush-tailed Phascogale (*Phascogale tapoatafa*) (**Priority 3**). Occurs in forest and woodland where suitable tree hollows are available.

Knowing which fauna species inhabit the bushland enables informed decisions to be made to protect those species. It is therefore recommended that fauna surveys be carried out, when possible, to record the species present.

Keeping a diary to record sightings of locally unusual fauna or abnormal occurrences together with dates can provide a useful reference to reflect on in future years and also adds to the available knowledge of the bushland's fauna.

FAUNA ACTIONS

WHAT: Collect information on fauna

WHO: Landholders and National Trust with the assistance of special interest groups

WHEN: As the opportunity arises

HOW: Conduct fauna surveys of the bushland

FAUNA ACTIONS

WHAT: Record any new or unusual sightings of fauna

WHO: Landholders

WHEN: As noticed

HOW: Keep a notebook in a vehicle used when visiting the property, or next to the phone on the office desk

Western Grey Kangaroos are increasing in number within bushland areas throughout the agricultural areas and may pose a problem by overgrazing native vegetation particularly during the drier months. Kangaroos will graze young, tender shoots and will preferentially graze certain species restricting natural regeneration and limiting the success of revegetation projects almost as effectively as heavy grazing pressure from domestic livestock.

It is therefore recommended that kangaroo numbers and their impact on the bushland be monitored.

FAUNA ACTIONS

WHAT: Monitor the impact of kangaroos grazing in the bushland

WHO: Landholders/National Trust can provide advice

WHEN: As time permits

HOW: Fence small areas to exclude kangaroos and take photographs of the vegetation growth within and outside the fenced areas

FAUNA ACTIONS

WHAT: Monitor kangaroo numbers in the bushland and surrounding paddocks and consider a local culling program if required

WHO: Landholders/Neighbours/Licensed Shooter

WHEN: As time permits

HOW: Morning and evening observations/Spotlighting/Damage Control Licence

5.11 Feral Fauna

Rabbits have been noticed on the property in recent years. Rabbits will adversely effect regeneration of the bushland and hinder any attempts to establish seedlings by eating and digging up and eating small seedlings resulting in low survival rates.

Rabbits also play a major role in introducing weeds into the bushland through seeds their droppings. Rabbit excavate warrens where soil type and depth permit and soil erosion often results if the warrens are in or near watercourses.

Rabbits can be controlled effectively with 1080 poisoned oats in the autumn months when feed from other sources is limited. Permanent bait stations can be established by using half 200lt drums or similar objects to protect the poisoned oats from wet weather. These types of bait stations also prevent non-target native species i.e. birds, that may be vulnerable to 1080.

Foxes, cats and rodents are also likely to be present in, or frequent visitors to, the bushland. Foxes and cats predate on many smaller native mammals, birds, reptiles, amphibians and invertebrates and are often responsible for localised extinctions of species such as Quenda or Numbats. Rodents, especially the European rat can displace native rodent type species such as the common Dunnart and Mardo.

Foxes are best controlled on a large scale as they quickly re-establish from unbaited areas following baiting. Shooting, baiting and cage trapping are all effective in reducing fox numbers.

Foxes are most vulnerable in spring, while cubs are still in the den and in autumn, when cubs are weaned and moving out to establish new territories, making these the optimum times to carry out control measures.

Cats prefer warm, dry places to rest during daylight hours such as disused farm buildings, old farm machinery and rubbish dumps making these the optimum places to set cat traps.

Feral pig activity was noted in the Bushland. Feral pigs are common near watercourses in the Darling Range and cause considerable damage to the bushland by digging up soil while searching for food. They often dig in areas that are sensitive and easily prone to soil erosion such as around granite rocks and along watercourses. Baiting, trapping and shooting are all effective means of controlling feral pigs.

Feral goats have been noted on the property in the past, but not in recent years.

It is recommended that rabbits, foxes, cats, goats, and pigs be controlled when necessary and where possible with the methods discussed above.

FAUNA ACTIONS**WHAT:** Control rabbits and goats**WHO:** Landholders**WHEN:** As required, when time permits**HOW:** By poisoning (1080), humane trapping and/or shooting**FAUNA ACTIONS****WHAT:** Control foxes, cats, rodents and pigs**WHO:** Landholders**WHEN:** As necessary**HOW:** By poisoning (1080), humane trapping and/or shooting**5.12 Fire Management**

The most recent fire occurred in the bushland in 1991, this followed a fire in about 1988.

Frequent fires can be detrimental to the regeneration of the bushland, as they may destroy smaller plants before they mature and are able to set viable seed. Fire also releases nutrients, reduces competition from established native species and opens up the tree canopy allowing additional light into the bushland, all of which encourage weed growth.

It is therefore recommended that the bushland be protected where possible from accidental burning and that prescribed burning be excluded for at least the next six years.

The existing firebreaks around the bushland required by law should be maintained; walktrails act as additional firebreaks and are useful to stop less intense or slow moving fires. Additional firebreaks or walk trails within the bushland are not recommended unless required by law.

Protection of buildings within the building envelope from fire can be achieved by maintaining a fuel free zone within a 20m of any part of the buildings and an additional fuel reduction zone within 100m of any part of the buildings. An adequate supply of water and a well-maintained fire-fighting pump, which does not rely on electricity, should also be in place to extinguish spot fires and aid in fire fighting.

Constructing buildings from materials that are resistant to such as earth, rock, brick, steel etc. is also advisable. Care should be taken with campfires and barbecues. When burning off within the building envelope: prevent sparks accidentally starting fires in the adjoining bushland.

FIRE MANAGEMENT ACTIONS**WHAT:** Maintain existing firebreaks**WHO:** Landholders**WHEN:** Annually before the onset of the dry season, when the fire risk is greatest**HOW:** By mowing, slashing or spraying. While maintaining firebreaks, all due care needs to be taken to avoid soil disturbance and prevent soil erosion

FIRE MANAGEMENT ACTIONS**WHAT:** Maintain existing walk trails**WHO:** Landholders**WHEN:** Annually before the onset of the dry season, when fire risk is greatest**HOW:** By removing fallen branches or slashing. While maintaining walk trails all due care needs to be taken to avoid soil disturbance and prevent soil erosion**FIRE MANAGEMENT ACTIONS****WHAT:** Develop Fire Management and Fire Evacuation Plans**WHO:** Landholders/FESA/Shire**WHEN:** As soon as possible**HOW:** Liaise with the Fire Emergency Services Officer at the Shire**5.13 Measuring Success (Monitoring & Evaluation)**

Monitoring is the key mechanism of bushland management. Without becoming aware of, and keeping records of, what is occurring within the bushland it is difficult to make informed management decisions.

The success of this management plan can be measured by whether each action has been carried out successfully and assessing the reason/s for any action that has not been successful. As part of the Stewardship Program, The National Trust will assist the owners to carry out an assessment of each action and its outcome for the duration of the Management Plan. Ongoing management advice will be provided if, and when, required.

In addition, fixed photo monitoring points should be set up and photographs taken by the landowners on a regular basis (preferably annual) or a National Trust staff member during stewardship visits. They should be sited to cover each different action. Guidelines for setting up photo monitoring are given in Appendix 5. A map for marking the position of the photo monitoring points is given in Appendix 6.

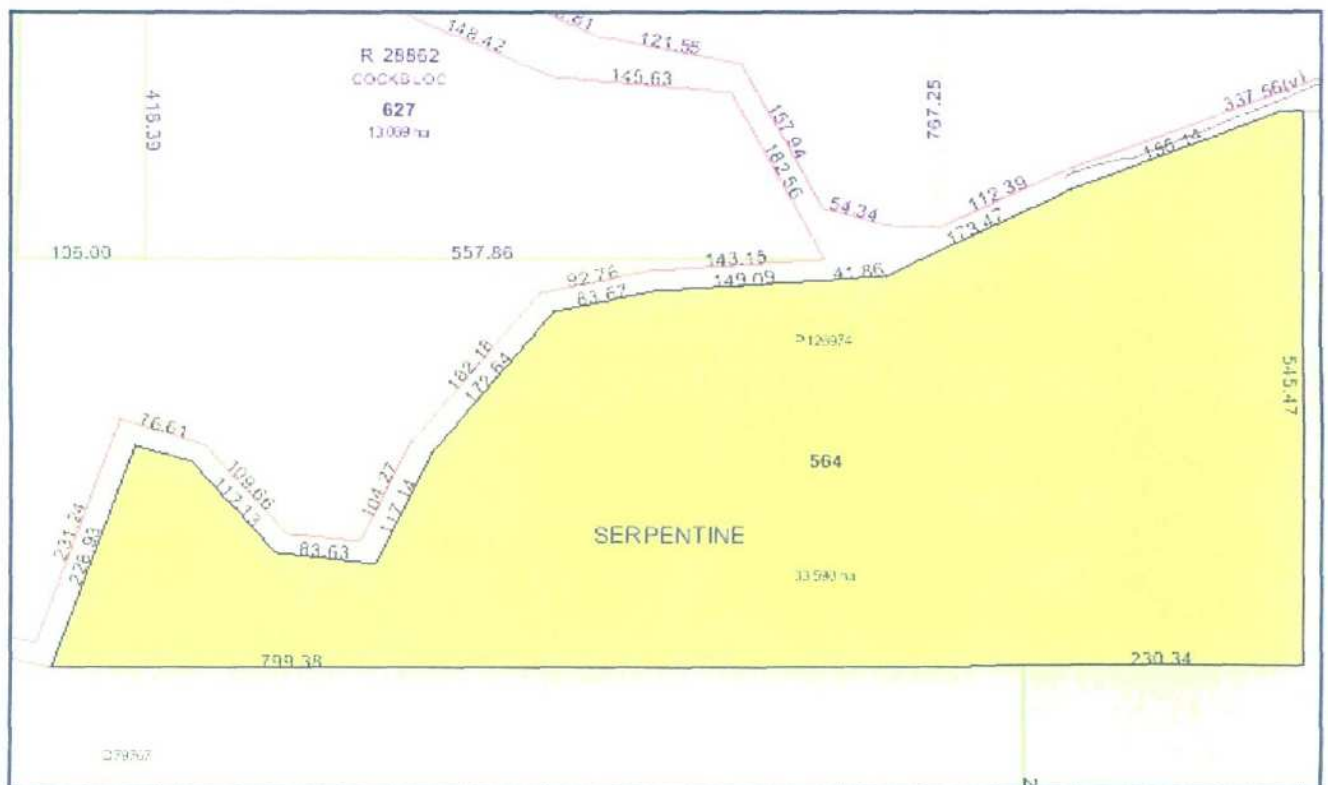
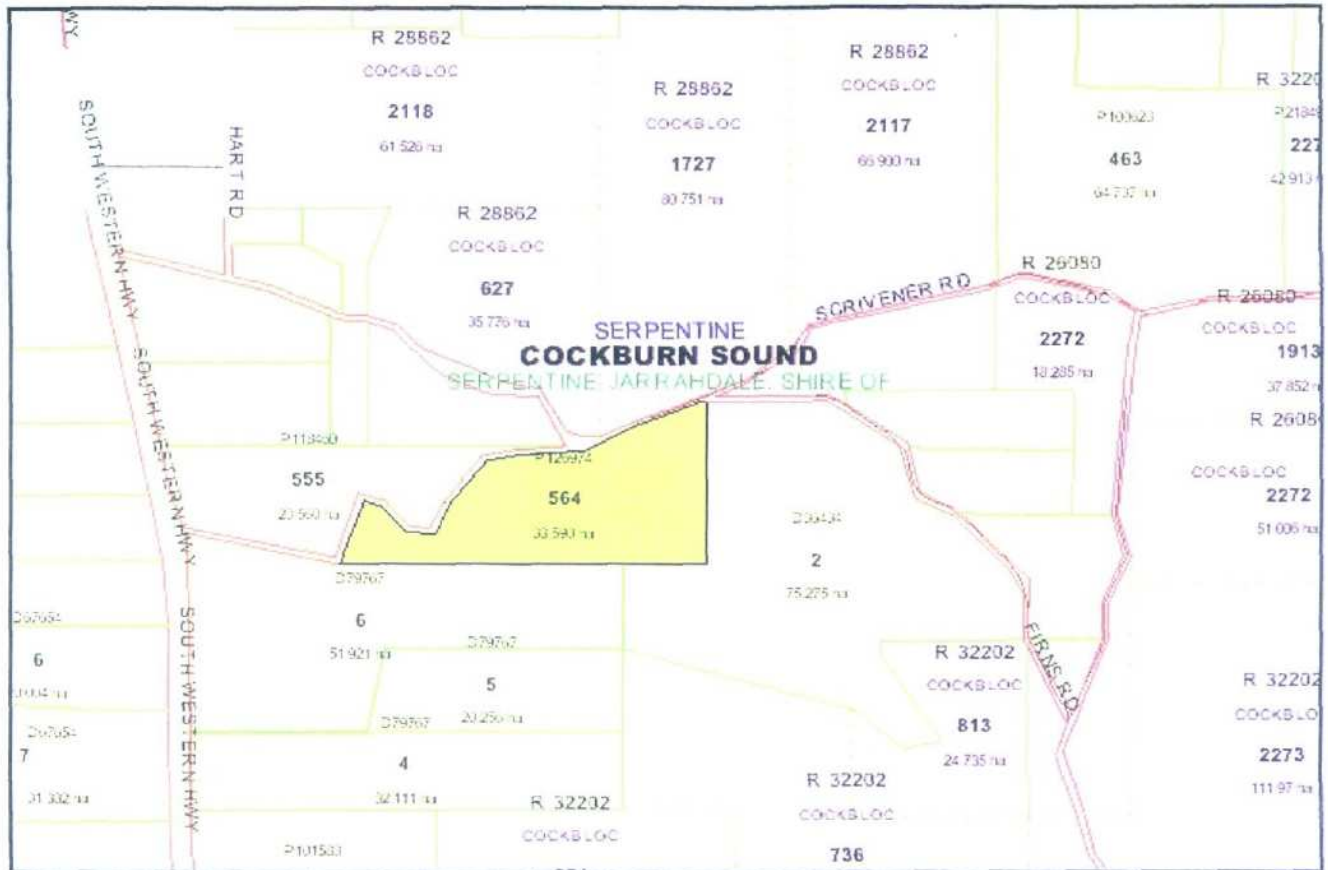
MONITORING ACTIONS**WHAT:** Assess each action presented in this management plan**WHO:** National Trust/Landholders**WHEN:** Annually**HOW:** Stewardship calls and property visits**MONITORING ACTIONS****WHAT:** Set up photo monitoring points to record changes**WHO:** National Trust/Landholders**WHEN:** As soon as possible**HOW:** By taking photographs from a fixed point regularly at the same time of day and year

6 APPENDICES

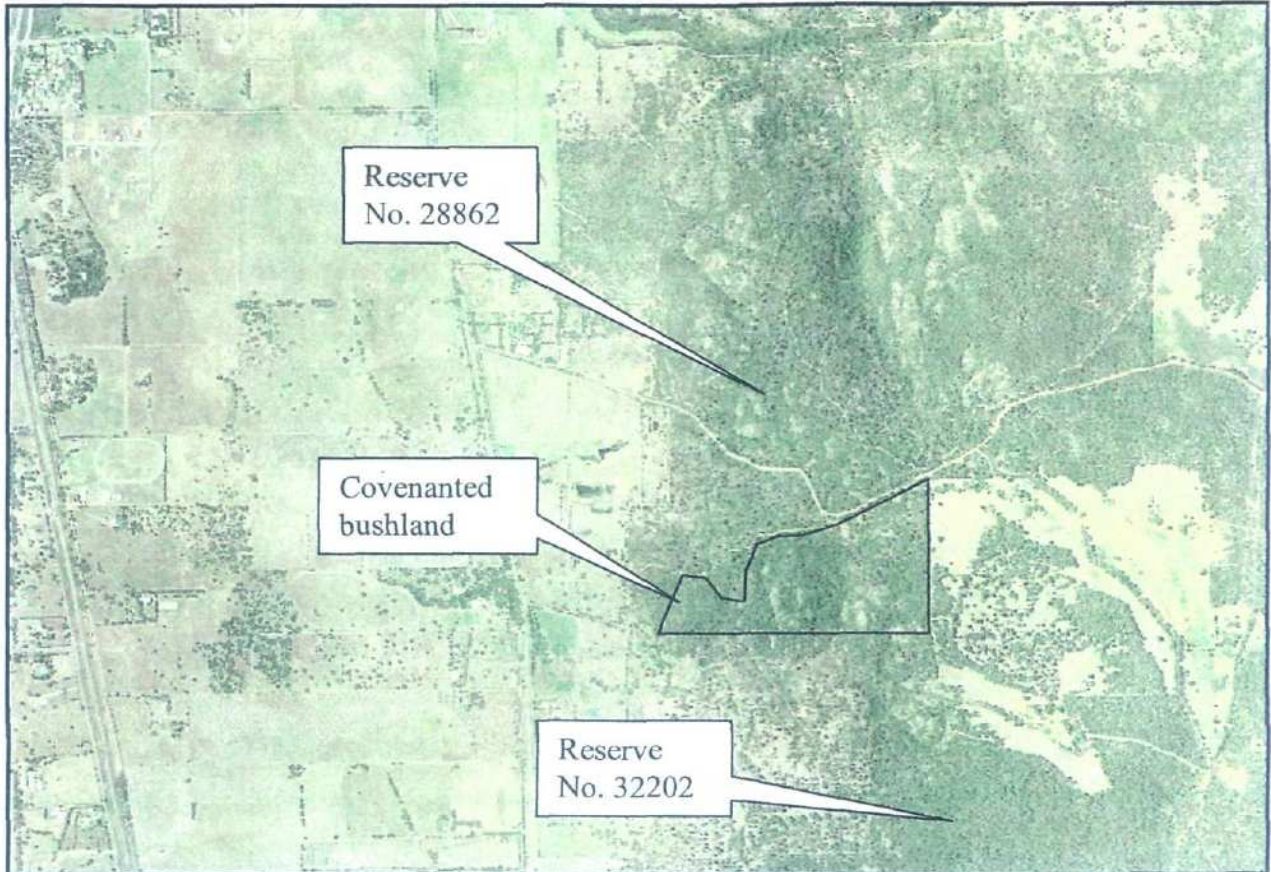
1. **Location of bushland**
2. **Aerial Photograph of bushland**
3. **Flora recorded in the covenanted bushland on Lot 564 Scrivener Road**
4. **Fauna recorded in the covenanted bushland on Lot 564 Scrivener Road**
5. **Photographic Monitoring of Vegetation**
6. **Photo monitoring point locations**
7. **Guidelines for seed collection from native plants**
8. **Guidelines for harvesting cutflowers from remnant vegetation**
9. **Recommended methods to control environmental weeds in the bushland**
10. **Dieback hygiene**

7 FURTHER READING AND REFERENCES

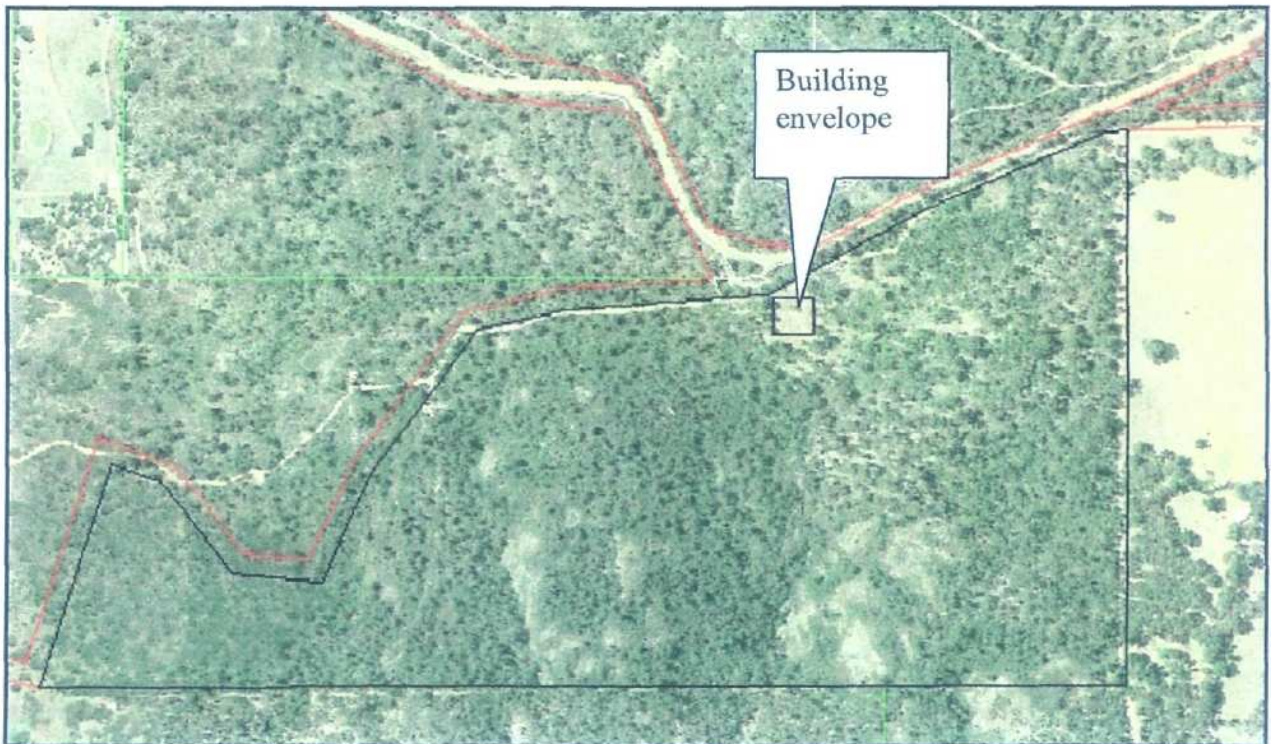
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- Wildlife Note No. 4 “Seed Collection from Native Plants” (1997) Land for Wildlife **DCLM**
- Wildlife Note No. 7 “Management Guidelines for Remnant Vegetation being Harvested for Cutflowers” (1999) Land for Wildlife **DCLM**
- Wildlife Note No. 9 “Photographic Monitoring of Vegetation” (2001) Land for Wildlife **DCLM**






LEGEND	
	Cockburn Sound Location 564
	Unallocated Crown Land
	Reserve
	Road
	Cadastral Boundary



Covenanted Bushland in the wider landscape



Covenanted Bushland

LEGEND	
	Road boundary
	Lot 564 boundary
	Other cadastral boundaries

Attachment 2: Flora Survey

Flora survey 29/9/11

Paul Lee – L564 Scrivener Road Serpentine

A Healthy Habitats Stewardship Program service provided by Dr Penny Hollick, Botanist and Natural Area Ecologist (Serpentine Jarrahdale Shire)

L564 Scrivener Road Serpentine is a 33 ha property which is still almost entirely vegetated by good to very good condition vegetation of Darling Scarp complex. It lies within a regional ecological linkage, has a stream running through it and lies partially within an environmentally sensitive area.

The dominant vegetation type on the property is Darling Scarp complex, with a number of different subcomplexes apparent:

1. Jarrah - marri (*Eucalyptus marginata* – *Corymbia calophylla*) woodland with a dense understorey;
2. Wandoo (*Eucalyptus wandoo*) woodland with an open understorey;
3. Dense shrublands on the steep mid-part of the Scarp;
4. Myrtaceous shrublands near the waterway; and
5. Diverse low shrublands on shallow soils associated with granite outcrops.

The vegetation is in good to very good condition, with scattered small degraded areas where the understorey has been replaced by introduced plants, mostly grasses.

This property is of high biodiversity value, possessing as it does a variety of vegetation complexes in good or better condition. The bushland has been unburnt for a long time. Weed density is variable, with introduced grasses dominating some degraded patches. Grazing by kangaroos and rabbits is evident in most areas. *Phytophthora* dieback may be present in the area, but most indicator species are common and healthy, indicating its current absence. Fauna is abundant, with evidence of habitation by quendas and echidnas, and a large Gould's monitor (*Varanus gouldii*) being sighted on 25/10/10.

A flora survey was carried out on 25 and 27 October 2010, to set up three monitoring quadrats on the property: one in the transition zone between jarrah-marri woodland and a granite outcrop, one in wandoo-marri woodland near the stream, and one in dense shrublands on the steepest part of the Scarp. The flora species found in each quadrat were recorded, including weeds (introduced species).

The quadrats were resurveyed on 29 September 2011, and additional species recorded from the area around each quadrat. Many plant deaths had occurred throughout the property, from small shrubs to large trees, likely due to the extremely dry conditions experienced during the winter of 2010 and into 2011. The good rains of winter 2011 resulted in regeneration of the surviving plants, and the annual plants were flourishing, along with many orchids.

The locations of the quadrats are shown in Figure 4, and photos of each in Figures 5-7. The flora list for the property is shown in Table 1, which also includes the species recorded during a preliminary walk-through survey on 8 September 2010.

A total of 124 species were recorded in 2010, of which 114 were native and 10 introduced weeds. Quadrat A (jarrah-marri woodland and granite shrubland) had 75 species recorded (including eight weed species); Quadrat B (wandoo-marri woodland) had 50 species recorded (including seven weed species); and Quadrat C (dense shrublands on steep Scarp) had 45 species recorded (including four weeds).

In 2011 the total number of recorded species increased to 150, of which 136 were native and 14 introduced weeds. 84 species were recorded in Quadrat A (including nine weed species) and an additional 14 species nearby (including two weeds), 65 in Quadrat B (including 10 weeds) with an

additional nine species nearby (including one weed), and 54 in Quadrat C (including five weeds) with an additional three species nearby (no weeds). The increase in the number of recorded species could be due to the survey being carried out earlier in the season, or to the wetter winter of 2011.

Table 1 – Flora list for L564 Scrivener Road, Serpentine (X = within quadrat, N = nearby)

Species (* denotes introduced or weedy plants)	Quadrat A		Quadrat B		Quadrat C		Walk-through h 8/9/10
	25/10/10	29/9/11	25/10/10	29/9/11	27/10/10	29/9/11	
<i>Acacia alata</i>	X	X		X			
<i>Acacia applanata</i>	X						
<i>Acacia horridula</i>					X	X	
<i>Acacia lasiocarpa</i>			X	X			X
<i>Acacia lateriticola</i>	X	X	X	X	X	X	
<i>Acacia pulchella</i>			X	X	X	X	
<i>Allocasuarina humilis</i>		N			X	X	X
* <i>Anagallis arvensis</i>	X	X	X	X	X	X	
<i>Andersonia sp.</i>	X	X					
* <i>Arctotheca calendula</i>		N		N		X	
<i>Astroloma ciliatum</i>	X	X					X
<i>Astroloma pallidum</i>	X	X					
<i>Austrodanthonia acerosa</i>	X						
<i>Austrostipa compressa</i>	X						
* <i>Avena barbata</i>	X			X			
<i>Baeckea camphorosmae</i>		X			X	X	
<i>Banksia dallanneyi</i>							X
<i>Banksia nivea</i>	X	X	X	X			
<i>Boronia crenulata</i>							X
<i>Boronia ramosa</i>						X	
<i>Borya nitida</i>		N					X
<i>Bossiaea eriocarpa</i>	X	X					
* <i>Briza maxima</i>	X	X	X	X	X	X	
* <i>Briza minor</i>		X					
* <i>Bromus hordaceus</i>	X						
<i>Burchardia congesta</i>	X	X	X	X	X	X	X
<i>Caesia micrantha</i>	X	X	X	X	X	X	
<i>Caladenia flava</i>				X			
<i>Caladenia longicauda</i>				N			
<i>Cassytha pomiformis</i>		X			X	X	
<i>Centrolepis aristata</i>		X				X	
<i>Chamaescilla corymbosa</i>	X	X		X	X	X	
<i>Cheilanthes austrotenuifolia</i>					X	X	
<i>Chorizema rhombeum</i>	X	X	X	X			X
<i>Conostylis aculeata</i>			X	X			
<i>Conostylis setosa</i>	X	X		N			
<i>Corymbia calophylla</i>	X	X	X	X	X	X	
<i>Dampiera alata</i>	X	X	X	X			
<i>Dampiera linearis</i>		X	X	X			X
<i>Darwinia thymoides</i>	X	X					
<i>Daviesia horrida</i>							X
<i>Daviesia preissii</i>	X	X					
<i>Desmocladus fasciculatus</i>			X	X		N	
<i>Dichopogon capillipes</i>				X	X	X	
<i>Dioscorea hastifolia</i>							X
<i>Diplopeltis huegelii</i>							X

Species (* denotes introduced or weedy plants)	Quadrat A		Quadrat B		Quadrat C		Walk-through h 8/9/10
	25/10/10	29/9/1 1	25/10/10	29/9/1 1	27/10/10	29/9/1 1	
<i>*Disa bracteata</i>		X	X	X	X	X	
<i>Diuris sp.</i>						X	
<i>Drosera erythrorhiza</i>						X	
<i>Drosera glanduligera</i>		N					
<i>Drosera menziesii</i>	X	X		N	X	X	
<i>Drosera pallida</i>		N					
<i>Drosera sp.</i>		X	X	X			
<i>Eucalyptus laeliae</i>			X	X			
<i>Eucalyptus marginata</i>	X	X		N			
<i>Eucalyptus megacarpa</i>				N			
<i>Eucalyptus rudis</i>				N			
<i>Eucalyptus wandoo</i>			X	X	X	X	
<i>Gastrolobium dilatatum</i>			X	X			
<i>Gastrolobium sp.</i>	X	X	X	X			
<i>Glischrocaryon aureum</i>	X	X					
<i>Gompholobium knightianum</i>	X	X					
<i>Gompholobium marginatum</i>	X	X			X	X	
<i>Gonocarpus pithyoides</i>	X	X	X	X			
<i>Grevillea bipinnatifida</i>	X	X					
<i>Grevillea leptobotrys</i>	X	X					
<i>Grevillea pilulifera</i>							X
<i>Haemodorum laxum</i>	X	X	X	X	X	X	
<i>Hakea lissocarpha</i>	X	X	X	X			X
<i>Hakea trifurcata</i>	X	X	X	X	X	X	X
<i>Hakea undulata</i>	X	X	X	X	X	X	X
<i>Hemigenia incana</i>							X
<i>Hibbertia amplexicaulis</i>							X
<i>Hibbertia commutata</i>	X	X	X	X			
<i>Hibbertia diamesogenos</i>	X	X					
<i>Hibbertia hypericoides</i>	X	X	X	X	X	X	
<i>Hibbertia serrata</i>			X	X			
<i>Hovea trisperma</i>							X
<i>*Hypochaeris glabra</i>	X	X	X	X			
<i>*Hypochaeris radicata</i>	X	X	X	X			
<i>Hypocalymma angustifolium</i>	X	X	X	X			X
<i>Hypocalymma robustum</i>	X	X	X	X			X
<i>Isolepis cernua</i>		X					
<i>Isopogon dubius</i>		N					X
<i>Isotoma hypocrateriformis</i>		X				X	
<i>Jacksonia alata</i>	X	X					
<i>Kennedia prostrata</i>				X			
<i>Kunzea micrantha</i>			X	X	X	X	
<i>Labichea punctata</i>		N					
<i>Lagenophora huegelii</i>		N	X	X			
<i>Lambertia multiflora ssp. darlingensis</i>		X					X
<i>Laxmannia squarrosa</i>	X	X					
<i>Lechenaultia biloba</i>	X	X			X	X	X
<i>Lepidosperma leptostachyum</i>	X	X			X	X	
<i>Lepidosperma pubisquameum</i>	X	X			X	X	
<i>Lepidosperma scabrum</i>					X	X	

Species (* denotes introduced or weedy plants)	Quadrat A		Quadrat B		Quadrat C		Walk-through h
	25/10/10	29/9/11	25/10/10	29/9/11	27/10/10	29/9/11	
<i>Leucopogon capitellatus</i>	X	X		X	X	X	X
<i>Levenhookia stipitata</i>		X		X			
<i>Lomandra preissii</i>	X	X					
* <i>Lotus angustissimus</i>		X	X	X			
<i>Macrozamia riedlei</i>	X	X	X	X		N	
<i>Melaleuca aff. scabra</i>	X	X	X	X	X	X	
<i>Mesomelaena tetragona</i>	X	X					
<i>Microlaena stipoides</i>			X	X			
* <i>Moraea spp.</i>		N					
<i>Neurachne alopecuroidea</i>	X	X			X	X	
<i>Orthrosanthus laxus</i>							X
<i>Oxalis perennans</i>			X	X			
<i>Patersonia occidentalis</i>		N		N			
<i>Petrophile biloba</i>	X	X					X
<i>Petrophile linearis</i>		N					
<i>Philothea spicata</i>	X	X				N	X
<i>Phyllangium paradoxum</i>		X					
<i>Phyllanthus calycinus</i>		N	X	X	X	X	X
<i>Pimelea brevistyla</i>							X
<i>Pimelea imbricata</i>	X	X					
<i>Pterostylis recurva</i>		N					
<i>Ptilotus manglesii</i>		N					
* <i>Romulea spp.</i>	X	X	X	X			
<i>Scaevola calliptera</i>	X	X	X	X		X	
<i>Schoenus clandestinus</i>	X	X					
<i>Stackhousia monogyna</i>							X
<i>Stenanthemum sp.</i>					X	X	
<i>Stylidium breviscapum</i>	X						
<i>Stylidium brunonianum</i>	X	X					
<i>Stylidium bulbiferum</i>	X	X	X	X	X	X	
<i>Stylidium calcaratum</i>						X	
<i>Stylidium hispidum</i>	X	X		N			
<i>Stylidium repens</i>		X	X	X	X	X	
<i>Synaphea acutiloba</i>							X
<i>Tetragonia octandra</i>	X	X	X	X	X	X	
<i>Tetragonia laevis</i>			X	X			
<i>Tetragonia nuda</i>	X	X					
<i>Thelymitra vulgaris</i>			X	X			
<i>Thelymitra sp.</i>	X	X					
<i>Thysanotus manglesianus</i>	X	X			X	X	
<i>Thysanotus sp.</i>	X						
<i>Trachymene pilosa</i>		X		X	X	X	
<i>Tricoryne elatior</i>	X	X			X	X	
* <i>Trifolium tomentosum</i>				X			
<i>Tripterococcus brunonis</i>	X	X			X	X	
<i>Trymalium ledifolium</i>			X	X	X	X	
<i>Trymalium odoratissimum ssp. odoratissimum</i>					X	X	X
* <i>Ursinia anthemoides</i>	X	X		X	X	X	
<i>Verticordia acerosa</i>							X
<i>Verticordia huegelii</i>	X	X					

Species (* denotes introduced or weedy plants)	Quadrat A		Quadrat B		Quadrat C		Walk-through
	25/10/10	29/9/11	25/10/10	29/9/11	27/10/10	29/9/11	
		1		1		1	8/9/10
<i>Wahlenbergia preissii</i>						X	
<i>Xanthorrhoea acanthostachya</i>	X	X			X	X	
<i>Xanthorrhoea preissii</i>		X	X	X	X	X	X
<i>Xanthosia huegelii</i>	X	X	X	X	X	X	

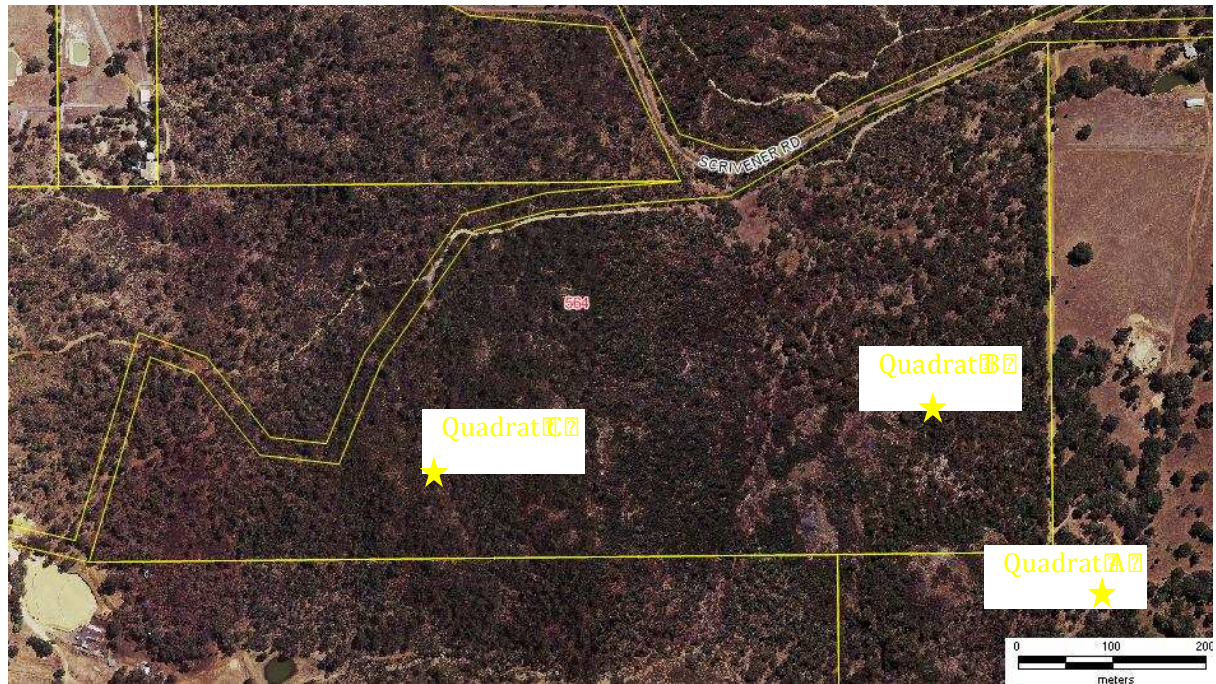


Figure 4: – Locations of monitoring quadrats.



Figure 5: Quadrat A (jarrah-marri woodland and granite shrubland), photos taken 29/9/2011.



Figure 6: Quadrat B (wandoo-marri woodland), photos taken 25/10/2010 (above) and 29/9/2011 (below).



Figure 7: Quadrat C (dense shrublands on steep Scarp), photos taken 27/10/2010 (above) and 29/9/2011 (below).