



Serpentine Cemetery Reserve Management Plan

**Final version 1a
2016 November**

Contents

1. EXECUTIVE SUMMARY.....	3
1.1 INTRODUCTION.....	3
1.2 OBJECTIVES.....	3
1.3 LOCATION AND DESCRIPTION.....	4
1.4 REPORT STRUCTURE	4
1.5 KEY PRIORITY ACTIONS.....	5
Table 1 – Key Priority Recommendations.....	5
2. GOVERNANCE.....	7
2.1 VESTING.....	7
2.2 LAND TENURE	7
Table 2 – Serpentine Cemetery Reserve Vesting Purpose	7
2.3 HISTORY AND CULTURAL HERITAGE	7
2.4 LEGISLATIVE AND POLICY FRAMEWORK.....	8
2.4.1 Environmental Protection and Biodiversity Conservation Act 1999.....	8
2.4.2 Metropolitan Region Scheme.....	8
2.4.3 Cemeteries Act 1986.....	8
2.4.4 Bush Forever	9
2.4.5 Wildlife Conservation Act 1950.....	10
2.4.6 Environmental Protection Act 1986	10
2.4.7 Aboriginal and European:	10
Heritage of Western Australia Act 1990 (State)	10
2.4.8 Town Planning Scheme No. 2.....	10
2.4.9 Compliance	11
2.5 GOVERNANCE RECOMMENDATIONS.....	11
TABLE 3 – GOVERNANCE RECOMMENDATIONS	11
3. ENVIRONMENTAL CHARACTERISTICS	12
3.1 PHYSICAL FEATURES.....	12
3.1.1 Land	12
Condition and Status	12
Major Threats and Pressures.....	12
3.1.2 Water.....	13
Condition and Status	13
Major Threats and Pressures.....	14
3.2 BIODIVERSITY	14
3.2.1 Condition and Status.....	15
Flora	15
Fauna.....	16
3.2.2 Major Threats and Pressures	16
Landscape and Character	16
Dieback.....	17
Clearing/Fragmentation	17
Fire	17
Weeds	17
3.3 ENVIRONMENTAL RECOMMENDATIONS	18
Table 4 – Environmental Recommendations.....	18
4. SOCIAL AND ECONOMIC CHARACTERISTICS.....	20

4.1	HERITAGE	21
4.1.1	<i>Indigenous Heritage</i>	21
4.1.2	<i>European Heritage</i>	21
4.2	COMMUNITY PARTICIPATION.....	22
4.3	ECONOMIC VALUES	23
4.3.1	<i>Business and Tourism</i>	23
4.3.2	<i>Infrastructure</i>	24
4.3.3	<i>Conservation of the Built Environment</i>	25
	Monuments.....	25
	Vandalism / Mechanical Damage	25
4.4	SOCIAL AND ECONOMIC RECOMMENDATIONS.....	25
	<i>Table 5 – Social and Economic Recommendations</i>	25
5.	IMPLEMENTATION	28
5.1	IMPLEMENTATION PLAN	28
	TABLE 6 – IMPLEMENTATION TABLE	28
	APPENDIX 1 – FLORA DETAIL.....	33
	Serpentine Cemetery Reserve (R10661) 2012	33

1. Executive Summary

1.1 Introduction

Approximately 1 hectare of the 2.4 hectare Serpentine Cemetery Reserve is built cemetery and associated infrastructure, while the majority of the reserve is recognized and protected as an Environmentally Sensitive Area and is formally managed and recognized as a portion of Bush Forever Site No. 371.

Bush Forever Site No. 371 is called “Serpentine River, Peel Estate to Serpentine” and is 86.4 hectares in total. This includes the Serpentine Cemetery Reserve, which is vested in the shire and unallocated crown land and private properties.

Burials in the Serpentine Cemetery date back to the 1870s. The local government manages the burials in the cemetery in collaboration with the Cemeteries Management Committee. The Cemeteries Management Committee was established in March 2000. The group consists of community members, Councillor Representatives and Shire Officers that meet every four months. The committee has been set up to ensure that members of the community take an active interest in assisting the local government in management, retention and promotion of the socio-economic, cultural, natural heritage and history of the cemetery and its surrounding areas.

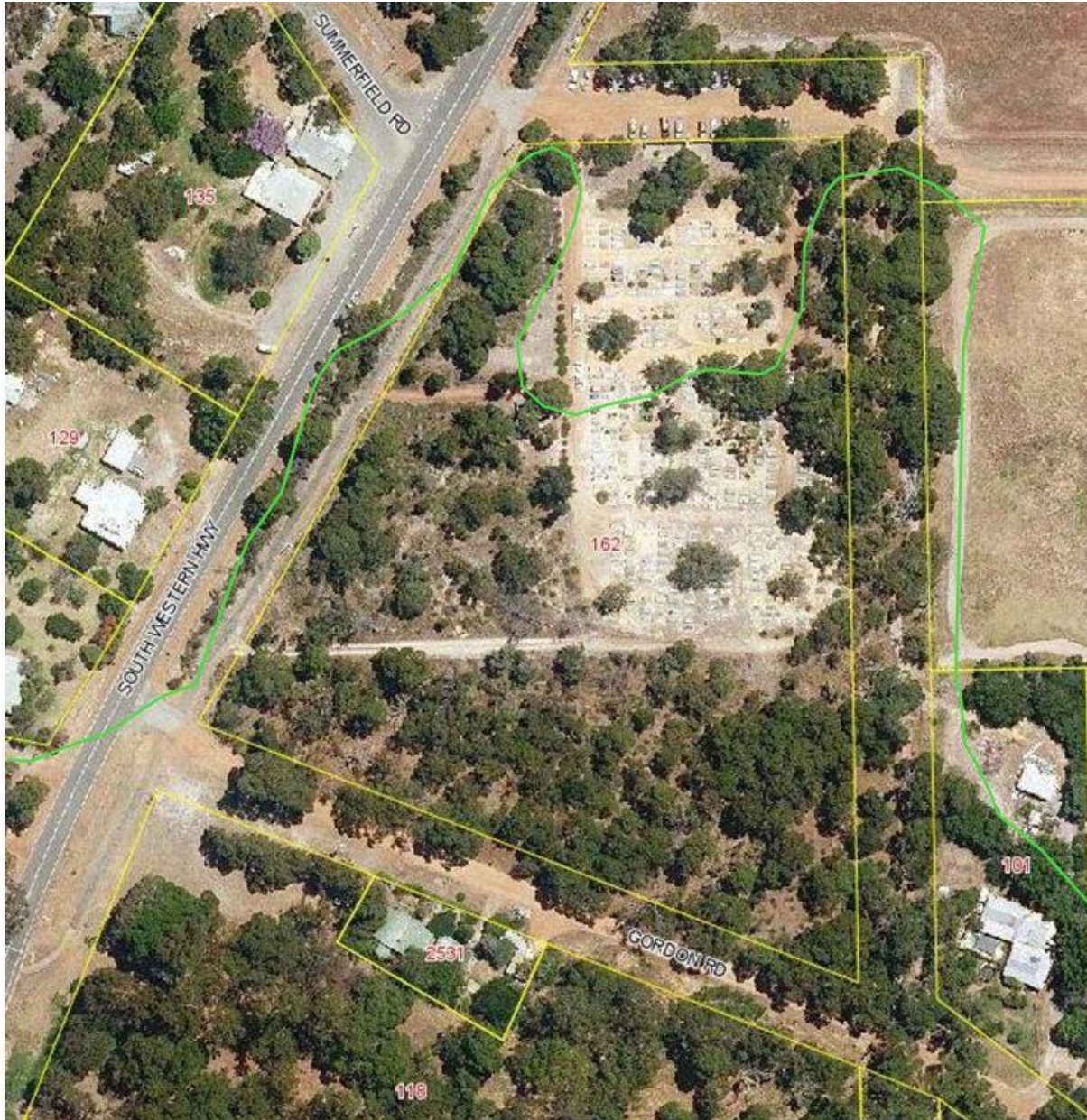
1.2 Objectives

- To provide the necessary background information and site descriptions for informed protection and management of the reserve.
- To define specific management objectives for maintaining and improving the conservation values of the reserve, including:
 1. Assess the vegetation quality, enhance and restore it as required;
 2. Embrace fire management, weed management, safety, aesthetics and public enjoyment of the cemetery, while acknowledging and managing the Bush Forever Site for its flora and fauna values;
 3. Document the actions required to successfully manage the reserve;
 4. Identify any management constraints and possible ways to overcome them;
 5. Ensure continuity of management in the future, so that the goal or focus is clearly defined and easy to follow; and
 6. Continue to provide the community with the opportunity to become involved in the decision-making processes for the reserve.

1.3 Location and Description

Serpentine Cemetery Reserve R10661 (Lot 162) is located opposite Summerfield Road, to the east of South Western Highway in Serpentine, approximately 2 kilometres from the town center. The reserve has an area of 2.44 hectares with Bush Forever Site 371 covering most of the reserve (Figure 1).

Figure 1 – Bush Forever Site Boundary and Aerial Photography



As Serpentine Cemetery is surrounded by vegetation, there is limited room for expansion of new burial areas. When this was identified, additional new plots which would not diminish the heritage and environmental values of the cemetery were established in 2014. This was the last expansion of the cemetery. Over the last 6 years burials have averaged around 10 a year and the extent of the life of the Serpentine Cemetery is about 3 to 4 years. The Rockingham Regional Memorial Park is currently available and a new Regional Facility in Whitby is being planned.

1.4 Report Structure

The Serpentine Cemetery Management Plan has been prepared to provide a clear direction for the future management and enhancement of the values of the Serpentine Cemetery.

This management plan has been written in accordance with the Reserves Planning and Management Policy. The policy adopted through Council resolution puts forward a formal management framework which ensures that the various uses of Shire reserves are managed in an equitable, integrated and sustainable manner. The Serpentine Cemetery Management Plan has been written in accordance with the appropriate planning process used for reserves with both high biodiversity and social values, with potentially conflicting uses needing to be resolved and properly managed.

Shire staff have worked closely with the Cemeteries Management Committee and the Reserves Advisory Group to develop management actions for the protection and enhancement of the reserves. This management plan will remain current for a period of ten years or more but may be reviewed within or after that time as required or appropriate.

1.5 Key Priority Actions

Table 1 – Key Priority Recommendations

No	Strategy	Priority	Implementation Status	Responsibility	Cost Estimates	Notes
Governance						
1	Change of reserve purpose to include Conservation along with the current purposes of Public Recreation, Public Open Space and Public and Community Purposes.	Key	Yet to be implemented	Environmental Services	Staff Time \$1,000	Within 3 months of completion of plan
Environmental Characteristics						
6	Liaise with the Emergency Service Officers to put in place a Fire Management Plan for the Reserve including a response plan.	Key	Ongoing	Emergency Services	Consultant \$3,000	
11	Strategically remove weeds, particularly Watsonia, from the Bush Forever Site 371 which is on local government reserve.	Key	Ongoing	Environmental Services and Community	Contract spraying – Every two or three years \$2,000 worth of weed spraying will be necessary	

No	Strategy	Priority	Implementation Status	Responsibility	Cost Estimates	Notes
					averaging out to about \$500 a year	
20	Develop a public awareness, appreciation and understanding program that targets local landowners and users of the reserve, to consider the value of flowering species in the reserve, impacts of weeds and the importance of good planning to protect the reserve from wildfire.	Key	Yet to be implemented	Environmental Services, Operations (Parks), Natural Reserves Coordinator and Landcare	Staff Time \$1,000	
Social and Economical Characteristics						
29	Encourage, support and facilitate the Cemeteries Management Committee and wider community to provide ongoing participation in the management of the reserve.	Key	Ongoing	Environmental Services	Staff Time \$1,000	

2. Governance

2.1 Vesting

Serpentine Cemetery Reserve has been vested with the Shire of Serpentine Jarrahdale for community purposes and as a public open space since 2013. Previously the reserve was vested with the Department of Planning, however the Shire has been managing the reserve since it was gazetted as a cemetery in early March 1907.

Owing to the Bush Forever status of the reserve and extensive remnant flora and significant fauna communities inhabiting the reserve, it is recommended that the vesting also include conservation as a purpose.

2.2 Land Tenure

The land tenure and vesting purpose of the several sections of the Serpentine Cemetery Reserve are shown below.

Table 2 – Serpentine Cemetery Reserve Vesting Purpose

Reserve Name	Reserve Number	Area (ha)	Purpose
Serpentine Cemetery	10661	2.44	Public and Community Purposes Public Open Space

2.3 History and Cultural Heritage

The Serpentine Cemetery was established in 1856 for the settlers in and around the Serpentine District. The District included settlements at Serpentine, Keysbrook, Mardella, Hopeland and Mundijong. The original cemetery had separate areas for Catholic and Protestant sites. However for the past fifty or so years, the cemetery has also become the resting place for people from outside the district and those of all religious denominations (Walk with Ancestors, Mann W, 2007). More recently, the restricted space has meant Council policy has become more selective, in that only people with a demonstrable connection to the Shire can be allocated plots for burial.

2.4 Legislative and Policy Framework

2.4.1 Environmental Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environmental Protection and Biodiversity Conservation Act* (EPBC) 1999 provides protection for areas, species and communities that are considered to have national environmental significance. It controls actions that will significantly impact on nationally endangered flora and fauna and threatened ecological communities that are listed under the Act.

The Serpentine Cemetery contains two rare flora species and one Threatened Ecological Community listed as endangered and protected under the Act. Any direct or indirect action that may have an impact on the community or species requires formal assessment.

2.4.2 Metropolitan Region Scheme

The Serpentine Cemetery is currently zoned “Rural/ Primary Regional Roads” under the *Metropolitan Region Scheme*. Consideration should be given to all adjacent road reserves to the Serpentine Cemetery Reserve being incorporated into the reserve particularly on the eastern boundary and the overall Metropolitan Region Scheme zone being changed to Parks and Reserves. Any development proposed within the reserve potentially effecting any local native vegetation will need to be referred to the Department of Parks and Wildlife as the area is an Environmentally Sensitive Area where any proposed clearing of native vegetation needs application for a clearing permit. With the management plan in place, ongoing management of the reserve can be guided in consultation with the Department of Parks and Wildlife and Department of Planning.

2.4.3 Cemeteries Act 1986

Management of local government cemeteries occurs under the *Western Australian Cemeteries Act 1986*, which provides for the declaration and management of cemeteries and describes the Cemetery Managers’ responsibilities in regulating all activities conducted within the cemetery. The Act also requires Local Governments ensure that cemetery records are kept current and that daily operations and community enquiries are dealt with, in the correct manner.

At a regional level, cemeteries are managed by the Metropolitan Cemeteries Board. They deal with the provision of guidelines for burials and cremations in Western Australia and are, a member and representative of the Cemeteries and Crematoria Association of Western Australia. In the local area, the Metropolitan Cemeteries Board has 40 hectares allocated in

the Whitby area for the development of a Regional Cemetery to accommodate residents located in the South Eastern Corridor of the Perth region. The Shire of Serpentine Jarrahdale manages two local cemeteries in the area.

The *Serpentine Jarrahdale Cemeteries Local Law 2005* enables Council to control the use of reserves allocated for the purpose of cemeteries within the Shire and permitted activities within this. It also provides for the administration and application for funerals, placement of ashes, burials, memorials and other works at the Shire's Cemeteries and outlines potential penalties for certain offences. Maintenance of the cemeteries is carried out by the local government.

The local government is primarily responsible for the administration of cemetery burials, cremated remains, monumental works, licenses and provision of and access to general information.

Burial plots are leased for a period of 25 years before renewal is necessary under a document known as a Grant Right of Burial. The land is never owned and when a grant expires and a renewal has not been issued, the control of the site reverts to the Shire of Serpentine Jarrahdale.

In the event that the Serpentine Cemetery becomes non-operational, administrative duties and advice will continue to be provided by the Shire, in order to ensure Cemetery records are accessible to the community.

The Serpentine Cemetery database is kept in the form of a photographic register and Microsoft Word database. Access to the information stored in the database is limited.

The operation of the cemetery is not limited to administration. Operations team are responsible for maintenance, capital works and development on an as-needed basis with the administration component being addressed by Officers in the Engineering Directorate. Annual budget recommendations are provided to ensure current practices in cemetery management are maintained, with the community assisting in the maintenance of the designated cemetery areas.

2.4.4 Bush Forever

The State government prepared the Bush Forever documents as a strategic plan to conserve bushland on the metropolitan portion of the Swan Coastal Plain. Bush Forever identifies areas of regionally significant bushland and strategies for their protection.

The remnant vegetation of Serpentine Cemetery is mapped within Bush Forever Site 371 which is 86.4 hectares and much of it is significant for the vegetation communities and flora and fauna species it supports as well as its role as a vegetation corridor.

The Bush Forever Site No. 371 is formally called "Serpentine River, Peel Estate to Serpentine" and is 86.4 hectares including the Serpentine Cemetery Reserve as well as unallocated crown land and parts which are on private properties along the Serpentine River foreshore. All of Bush Forever Site No. 371 is managed collaboratively with SJ Landcare Inc., the Shire and the private property owners.

2.4.5 Wildlife Conservation Act 1950

The Western Australian *Wildlife Conservation Act 1950* provides controls for the protection of native species, especially rare and threatened species of flora and fauna. The Department of Parks and Wildlife enforces this legislation at a State level, administering approvals to take declared rare flora and threatened fauna and to carry out activities that impact on threatened ecological communities.

The Serpentine Cemetery contains two flora species listed as Endangered and one Threatened Ecological Community listed as Critically Endangered.

2.4.6 Environmental Protection Act 1986

Under the *Environmental Protection Act 1986*, the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* control the clearing of native vegetation within Western Australia. Any proposed clearing of native vegetation requires an application to be lodged with the Department of Environment Regulation (DER) for assessment, with no exemptions applying to this area as it is an Environmentally Sensitive Area (ESA).

2.4.7 Aboriginal and European:

Heritage of Western Australia Act 1990 (State)

The *Heritage of Western Australia Act 1990* provides a framework for the conservation, maintenance and restoration of historical buildings and sites within Western Australia. Under this legislation lies the Register of Heritage Places which provides Official recognition of places of cultural heritage significance. The Serpentine Cemetery has been included on the State's Register of Heritage Places. The Serpentine Cemetery Reserve is a registered Heritage Site, requiring amongst other things careful observance of the Aboriginal Heritage Due Diligence Guidelines issued by the Department of Aboriginal Affairs.

Under Section 45 of the Act, the Shire is required to prepare a Municipal Inventory to recognise important heritage places within the Shire. Places within the Municipal Inventory are only protected legally if they are included in the Town Planning Scheme or under the Heritage of Western Australia's State Register of Heritage Places. The Serpentine Cemetery was included in the Serpentine Jarrahdale Municipal Inventory in July 2000.

2.4.8 Town Planning Scheme No. 2

Under the Serpentine Jarrahdale *Town Planning Scheme No. 2* (TPS2), the northern portion of Serpentine Cemetery, including the built area, is zoned for “public and community purposes” and the southern section is zoned “public open space”. Any road reserves included within the reserve system may be subject to road widening proposals which will need to consider the remnant vegetation of any unmade road areas in the context of a clearing permit.

2.4.9 Compliance

Before undertaking any works in the cemetery, permission must be sought from the local government where applicable. When necessary the local government will refer compliance matters to relevant authorities and advise of the relevant procedure particularly in regard to the reserves Bush Forever Status.

2.5 Governance Recommendations

Table 3 – Governance Recommendations

No	Strategy	Priority	Implementation Status	Responsibility	Cost Estimates	Notes
Governance						
1	Change of reserve purpose to include Conservation along with the current purposes of Public Recreation, Public Open Space and Public and Community Purposes.	Key	Yet to be implemented	Environmental Services	Staff Time \$1,000	Within 3 months of completion of plan
2	Fulfil obligations under all relevant legislation including the Native Title Act 1993.	High	Ongoing	Environmental Services	Staff time \$1,000	
3	Maintain active liaison with the Cemetery Committee via four-monthly meetings and review the role and composition of the group periodically.	High	Implemented in part	Environmental Services	Staff time \$1,000	

3. Environmental Characteristics

3.1 Physical Features

3.1.1 Land

Condition and Status

The Serpentine Cemetery consists of soil of the Ridge Hill Shelf Formation derived from the material eroded from the Darling Scarp and fluvial deposits. Two distinct soil types can be seen within the Serpentine Cemetery Reserve as described below.

Forrestfield (D Range) Phase (Ff2)

Soils of this type are found in the southern portion of the cemetery reserve. They are described as Foot and low slopes <10%. Well drained gravely yellow or brown duplex soils with sandy topsoil.

Forrestfield (D Range) Phase (Ff7)

Soils of this type are found in the northern portion of the cemetery reserve. This soil type is described as Alluvial fans on slopes <5-10%. Variable imperfectly drained soils comprising layers of sand, sandy loam, clay grit and weathered granitic detritus. Semi wet soil.

Major Threats and Pressures

Poor agricultural management practices can lead to soil degradation. The range of degrading processes for soils include water and wind erosion, waterlogging, grazing, phosphorus (and other nutrient) export, secondary salinity, soil structure decline and subsurface acidification. Land degradation is a result of a complex interplay between land and soil properties and their management. Good land management requires a range of highly developed knowledge and practical skills.

Erosion

Water or wind erosion is the mobilisation of soil caused by excessive water runoff or wind in cleared landscapes. The soils of the northern portion of Serpentine Cemetery have the greatest risk of developing water erosion problems, which includes the pathways and the developed portion of the reserve. Water erosion issues may be mitigated by spreading gravel over affected areas and controlling sheet flow from the site.

Prior to a burial, staff excavate the selected site. A mechanical excavator is used for this and once the grave has been dug a shoring box is placed in the grave to provide support and reduce soil movement. On completion of the ceremony, the shoring box is removed and soil is replaced in the grave and mounded. Over the subsequent 6 to 12 months, the grave settles and the mound reduces in size so that the family can place a monument.

The roots of plants act to stabilise soil and control erosion. Plants can also add to the aesthetic value of the cemetery, and including new local native species can act to stabilise add to the biodiversity values and add to the aesthetic values of the cemetery.

Waterlogging

Waterlogging has occurred historically in this site when the water table was much higher. In our drying warming climate this may not be an issue anymore, however waterlogging has resulted in lack of oxygen, reduced plant growth and in some severe cases, prolonged plant death. The soil in the northern portion of Serpentine Cemetery is at a higher risk of waterlogging than the southern portion.

Phosphorus export

Phosphorus detention refers to the soil's ability to retain phosphorus, and hence leaching and transport of this nutrient coincides with water availability. Other factors which assist in increasing phosphorus export include excessive vegetation clearing, drainage of waterlogged soils and the application of highly soluble fertilizers. Where areas are prone to waterlogging, sedges and rush can be introduced to reduce the amount of water at the site as well as filter the nutrients in the water and reduce phosphorus export from the site.

3.1.2 Water

Condition and Status

The Serpentine Cemetery Reserve is adjacent to the Serpentine River near the Darling Scarp and Serpentine Falls. The water resources of the Serpentine Cemetery include the artificial drainage system and the groundwater natural resource.

This area is part of the Peel Harvey Catchment. The Serpentine River and its tributaries flow into the Peel Harvey Estuary, an internationally significant wetland, within which nutrient eutrophication is a significant issue affecting both conservation and recreational values of the estuary and its wetlands.

Surface water

The Serpentine Cemetery has a gentle south-western slope, down which the surface water drains into the Serpentine River via the constructed drains to the east and west. The river eventually turns into a modified drainage system of the Birrega drain which enters the Peel Harvey Estuary. Two policy documents, *Statement of Planning Policy No.2* and the *Environmental Protection (Peel Inlet – Harvey Estuary) Policy 1992*, relate to the land use and nutrient export entering the Peel Harvey Estuary.

Groundwater

Superficial formations exist near the surface of the Guildford clays, and below this is a major confined aquifer named the Leederville Aquifer. Underlying the Leederville formation is another major aquifer, the Yarragadee.

The superficial aquifers seasonally or permanently contain groundwater. Recharge occurs from rainfall, local stream runoff and upward leakage from the Leederville aquifer. The shallow water table limits groundwater storage.

When grave excavations take place in the winter months, the water table rises to approximately one and a half metres from the soil surface. A pump is used to remove the water prior to the burial service to prevent possible floatation.

The Serpentine Cemetery is within the Serpentine Groundwater Area and the proposed Priority 3 (P3) area of the Karnup – Dandalup Underground Water Pollution Control Area (UWPCA), but does not use groundwater. Priority 3 protection areas are defined to manage the risks of pollution to the water source and there are restrictions on land uses considered to have significant pollution potential.

Water use

The Serpentine Cemetery utilises scheme water for use in toilets, wash basins and keeping the site tidy.

Major Threats and Pressures

Water Quality

Any impact of the Serpentine Cemetery on the water quality of the Serpentine River is considered minimal, but attempts should be made to minimise its impacts. Silt from un-vegetated, sandy areas of the cemetery are likely to add to fine soil particles exported off the site in the first rains of winter. Stabilization of this area would decrease the fine soil particles being exported off site.

3.2 Biodiversity

The definition of biodiversity adopted by the National Strategy for the Conservation of Australia's Biological Diversity is:

“The variety of life forms: the different plants, animals and micro-organisms, the genes they contain, and the ecosystems they form. It is usually considered at three levels: genetic diversity, species diversity and ecosystem diversity.”

The Serpentine Cemetery has been identified as an Environmentally Sensitive Area for the vegetation communities and species it contains and its corridor function. Bush Forever site 371 covers the majority of the reserve and includes most of the graves and the built cemetery.

Implications of the Bush Forever status of the reserve means liaising with the Department of Planning and Department of Parks and Wildlife is of particular importance including sharing the latest botanical survey information. Once a management is in place that has been approved by these two agencies, actions can take place much more confidently, as long as they are consistent with the implementation of the management plan.

Serpentine Cemetery Reserve contains Threatened Ecological Communities. The dominant species in the reserve are *Corymbia calophylla*, *Kingia australis* and *Nuytsia floribunda*, which

are characteristic of Threatened Ecological Communities on the Swan Coastal Plain. The community SCP3a found within the Serpentine Cemetery Reserve is Critically Endangered under Western Australian criteria and Endangered under the Commonwealth Environmental Protection and Biodiversity Act 1999. The Declared Rare Flora *Tetraria australiensis* is recorded to occur within Serpentine Cemetery Reserve.




3.2.1 Condition and Status

Flora

Serpentine Cemetery reserve contains three distinct community types: *Corymbia calophylla* over *Mesomelaena tetragona* sedgeland; *Corymbia calophylla* / *Nuytsia floribunda* over *Xanthorrhoea preissii* / *Mesomelaena tetragona*; and *Eucalyptus marginata* / *Corymbia calophylla* / *Nuytsia floribunda* (Figure 2). *Watsonia* is a prolific local weed which has been the target of a weed eradication program for some years now and is generally under control currently.

Figure 2 – Vegetation Communities of the Serpentine Cemetery Reserve.



Vegetation Types	
	Corymbia calophylla open woodland over Mesomeleena tetragona sedgeland
	Corymbia calophylla/Nuytsia floribunda open woodland over Xanthorrhoea preissii open shrubland over Mesomeleena tetragona sedgeland
	Corymbia calophylla/Eucalyptus marginata ssp. thalassica woodland over closed Watsonia sp. herbland

The Serpentine Cemetery Bushland has Guildford Complex vegetation, which is poorly represented on the Swan Coastal Plain with less than 5% remaining in the Perth Metropolitan Region.

The overall vegetation condition of Serpentine Cemetery is classified as 'good'. The structure of the vegetation has been significantly altered by multiple disturbances, but the community retains its basic vegetation structure and the ability to regenerate. Maps need to be prepared and updated as required for the vegetation condition, weed locations usually on the perimeter of the reserve and dieback presence.

The two high priority weed species of concern which occur in Serpentine Cemetery reserve are *Watsonia* and *African Lovegrass*. *Watsonia* is considered the biggest threat, and selective control of *Watsonia* has been regularly undertaken. *Watsonia* regenerates from soil seed stock and underground corms and requires ongoing control via spot spraying or wiping while flowering but before seed set.

Fauna

The Serpentine Cemetery bushland offers an area of valuable habitat and provides a linkage between the Serpentine River and other areas of remnant vegetation, which allows for movement of fauna. Mammals recorded in the reserve include the Western Grey Kangaroo *Macropus irma* and the Quenda *Isodon obesulus fusciventer*. No fauna monitoring has occurred in the reserve to identify other species present, but a range of invertebrates, birds, reptiles and amphibians have been informally observed. Identified introduced animals include rabbits, evidenced by droppings and diggings found throughout the reserve.

3.2.2 Major Threats and Pressures

Landscape and Character

The character of this cemetery has been captured in its site layout and placement amongst remnant vegetation. Where any non-natives trees have been established, their removal and replacement with local native species is recommended be carried out over a number of years, focusing primarily within the Bush Forever vegetation site. Targeted *Watsonia* control has been undertaken with some success over the years. Mature trees within the cemetery may pose some risk of the roots causing disturbance to graves so these need to be considered accordingly with new introduction of local native species mostly being comprised of small to medium trees and shrubs.

Construction of infrastructure is and will continue to be minimalistic and carefully designed such that pathways and walls are sympathetic to the landscape and its character.

Dieback

Phytophthora cinnamomi is a soil-borne water mould that invades plants roots and stems and kills susceptible plants. Dieback is spread by two mechanisms: the movement and relocation of infested soil and plant material; and movement in water or by root to root contact in plants.

At least 40% of the species occurring in the South West Botanical Province are susceptible to *Phytophthora* (dieback). This can result in loss of biodiversity, change in vegetation structure and alteration of fauna habitats.

There have been several deaths of Banksia and Jarrah trees at the south-east boundary of the Serpentine Cemetery reserve near the constructed drain indicating that dieback could be present in the area.

There are no eradication measures for *Phytophthora cinnamomi*, but strategies can be undertaken to minimize its spread and intensification. Preventing the movement of infected soils and treating susceptible plants with phosphoric acid has proven to be effective in slowing the spread and intensification of dieback. Signage, boot cleaning stations and making sure any materials used within the reserve have dieback free status are also important preventative measures.

Clearing/Fragmentation

Corridors and clumps of remnant vegetation are important for habitat creation and movement of fauna. Vegetation plays a critical role in maintaining ecological processes and if degraded this can detrimentally affect the condition of land and water.

Under the amended *Environmental Protection Act 1986* clearing of native vegetation in Environmentally Sensitive Areas (ESA) requires a clearing permit. The Serpentine Cemetery is an Environmental Sensitive Area as it is a Bush Forever Site and contains Declared Rare Flora and Threatened Ecological Communities. Clearing intentional or otherwise will result in further loss of biodiversity and habitat abundance and diversity and can attract significant fines from the State and/or Commonwealth governments.

Fire

Fire is a natural process in South West ecosystems but an extremely hot wildfire can be a threat to biodiversity. Unplanned fire is a considerable threat to the Serpentine Cemetery Reserve. The most appropriate method of protection is proactive prescribed burning and maintaining good fire breaks and low fuel loadings in strategic locations for protection. A mosaic of burning regimes can be maintained which promotes diversity of flora and fauna. Any proposed prescribed burning will need to be planned with the Department of Parks and Wildlife as a potential minimum inter-fire period of 8 to 6 years is usually recommended with individual consideration based on species composition in this vegetation which includes State and Commonwealth protected critically endangered threatened ecological communities.

Weeds

Weeds compete with native vegetation for space, sunlight, water and nutrients and can eventually displace native understorey. This is a threat to both flora and fauna. Weed control using physical, chemical or biological control methods in the cemetery needs to be carried out.

The two high priority weeds for management in Serpentine Cemetery Reserve are the Declared Weed Plants *Watsonia* and African Lovegrass. Declared weeds are 'Declared' under the Agriculture and Related Resources Act (ARRP Act) and these require that landholders control or eradicate these weeds so the local government has an ongoing commitment to weed control each year.

3.3 Environmental Recommendations

Table 4 – Environmental Recommendations

No	Strategy	Priority	Implementation Status	Responsibility	Cost Estimates	Notes
Environmental Characteristics						
Land Resources						
4	Include gravel surface over walkways to prevent wind erosion and to increase the aesthetic value of the cemetery.	Medium	Not Yet Implemented	Engineering Services	Staff Time \$1,000	
Water Resources						
5	Consider an asphalt driveway to enhance the overall appearance of the cemetery and to address the onsite drainage water moving into existing drainage infrastructure.	Medium	Not yet Implemented	Engineering Services	Staff Time \$1,000	
Fire						
6	Liaise with the Emergency Service Officers to put in place a Fire Management Plan for the Reserve including a response plan.	Key	Ongoing	Emergency Services	Consultant \$3,000	
7	Carry out fuel reduction protection burns in consultation with the Department of Parks and Wildlife to protect specific biodiversity values and so as to create a mosaic of burning regimes resulting in maximising biodiversity opportunities.	High	Implemented in Part	Fire and Emergency Services Voluntary Bushfire Brigade each year	Staff time \$1,000	Mosaic burning regimes are best achieved through a combination of small protection fuel reduction burns done through a variety of seasons and conditions along with containment of any small unplanned burns.

No	Strategy	Priority	Implementation Status	Responsibility	Cost Estimates	Notes
8	Follow up any burning with weed spraying, as fire promotes new weed species growth, and replacement with native plants.	High	Implemented in Part	Natural Reserves Coordinator and Operations	Contractor \$3,000	Removal of weeds opportunistically following on from planned or unplanned burns.
Dieback						
9	Carry out phosphite injections in trees presenting early signs of infection.	High	Not yet Implemented	Operations Parks and Natural Reserves Coordinator	About \$0.50 per tree \$1,000	
10	Practice dieback hygiene, including restricting materials brought onsite to be dieback free only and consider signage and an associated boot cleaning station while monitoring the effect and spread of dieback within the reserve.	High	Implemented in Part	Operations Parks and Natural Reserves	Staff Time \$1,000	
Weeds						
11	Strategically remove weeds, particularly watsonia, from the Bush Forever Site 371 which is on local government reserve.	Key	Ongoing	Environmental Services and Community	Contract spraying – Every two or three years \$2,000 worth of weed Spaying will be necessary averaging out to about \$500 a year	
12	Review annually and implement a Weed Control Plan that maps and identifies weed species, vegetation condition and dieback presence within the reserve, and identifies priority areas and appropriate techniques and strategies to reduce weed density and weed seed sources.	High	Implemented in Part	Environmental Services Operations Parks and Natural Reserves Coordinator	Staff Time \$1,000	
Revegetation						
13	Use nearby local vegetation communities as a guide to the local flora when revegetating the reserve.	High	Implemented in Part	Operations Parks and Natural Reserves and Community	Staff Time \$1,000	
14	Plant a variety of understorey vegetation, which will provide fire safe adequate bandicoot habitat, while slowly removing Watsonia and other weeds.	High	Not Yet Implemented	Operations Parks and Natural Reserves Coordinator	Staff Time \$3,000	

No	Strategy	Priority	Implementation Status	Responsibility	Cost Estimates	Notes
15	Formalise and restrict access to the memorial niche wall in order to protect in particular remnant vegetation.	Medium	Implemented in Part	Operations Parks and Natural Reserves Coordinator	Staff Time \$1,000	
Biodiversity						
16	Monitor the recovery of plant communities after fire and use this information in plan reviews and revisions so low flammability local native species can be included in future plantings.	High	Not yet Implemented	Environmental Services Operations Parks and Natural Reserves Coordinator	Staff Time \$1,000	
17	Identify and quote to remove all non-local trees and shrubs from the reserve particularly invasive ones.	Medium	Implemented in Part	Operations, Parks and Natural Reserves Coordinator	Staff Time \$1,000	
18	Regularly monitor and record feral animals around the reserve. Undertake control programs when needed.	Medium	Yet to be Implemented	Operations, Parks and Natural Reserves Coordinator in conjunction with Landcare	Staff Time \$1,000	
19	Advise all local residents of the impacts of dogs and cats on the reserve fauna.	High	Yet to be Implemented	Environmental Services and Landcare	Staff Time \$1,000	
20	Develop a public awareness, appreciation and understanding program that targets local landowners and users of the reserve, to consider the value of flowering species in the reserve, impacts of weeds and the importance of good planning to protect the reserve from wildfire.	Key	Yet to be implemented	Environmental Services, Operations (Parks), Natural Reserves Coordinator and Landcare	Staff Time \$1,000	

4. Social and Economic Characteristics

4.1 Heritage

4.1.1 Indigenous Heritage

The indigenous people of the South West of Western Australia are collectively known as Nyoongar. Within this region there are 13 tribal areas of Indigenous people.

With European settlement Indigenous people have been forced to alter their traditional semi-nomadic hunting and gathering lifestyle. European settlement favoured farming of land and living within landscapes in close proximity to river systems. This was also prime Nyoongar hunting and gathering locations for accessing wild berries, roots, grubs, larger mammals and aquatic food collection.

Of significance to the Serpentine Cemetery site is the Dreaming Ancestor the Waugul or the Nyoongar Rainbow Serpent. The Waugul is believed to be the creator of the *bilya* (rivers), *kaart* (hills) and *ngamar* (waterholes). Nyoongar culturally significant areas exist around most waterways and wetlands.

In the territory of the Nyoongar people, burial traditions varied from the scarp to the plains. Usually a corpse was buried in its cloak, and a 'doctor' was present at the ceremony to ensure that the spirit had departed the body. "A small tomb of reeds or boughs was constructed over the grave and a fire lit at the entrance to make the place more comfortable and home like for the spirit. The soul of the newly dead would go to *Kurannup*, the home of the dead beyond the western sea. Here the old skins were discarded and appeared white. The arrival of the first Europeans was at first believed to be the return of the dead" (Stewart 1988).

The Serpentine Cemetery is adjacent to the Serpentine River, which is listed on the Department of Indigenous Affairs register of mythological and ceremonial sites. The registered site includes a wide enough buffer to encompass all significant sites that occur in the vicinity. Serpentine Cemetery is within the buffer and therefore formally listed as part of a Heritage Site under the *Aboriginal Heritage Act 1972*.

A Native Title claim of the Gnaala Karla Boodja Land exists over the South West geographical province. Native title claims are coordinated by the South West Land and Sea Council (SWALSC), the representative body for Nyoongar people.

Indigenous consultation during the preparation of this management plan has been via Nyoongar Elder Mr Harry Nannup and comments on this draft management plan will be sought from the South West Aboriginal Land and Sea Council.

4.1.2 European Heritage

Cemeteries are a historic record of European Australian society. The graves and monuments provide demographic data about a community for example individual members and families of local significance. Monuments and graves of the settlers who lived in the district at that time

are contained in the Cemetery and many of their descendants are prominent residents in the Shire today.

Graves date from the early days of settlement to the present day. The original gazettal date of the Serpentine Cemetery was 28 March 1907, but headstones have confirmed that burials date from 1873 and it is assumed that people were buried on this site soon after survey of the land in 1849. The Serpentine Cemetery is situated in the old town site which contains key elements of the village center and original settlers' cottages along the South Western Highway.

The first settlers arrived in 1849 and the town site developed where the main road crossed the Serpentine River. Many of these early families worked in the local flour mills. In 1856, land was surveyed around the bridge for a schoolhouse, cemetery and church, and the original schoolhouse and teacher's quarters were built. In the 1860s local industries included timber, sawmills, flour mills and grazing.

The railway arrived in 1893 and a new town center was developed. The townscape is further enhanced by the town site's features such as the cemetery, prominent Moreton Bay Fig tree in front of the school and the remnant bushland between the school, cemetery, adjoining farms and the Serpentine River.

It has been recommended that consideration be given to adding "Serpentine Conservation Area" inclusive of the Cemetery into the Serpentine Jarrahdale Municipal Heritage Inventory during the next review.

Record-keeping problems in the past have made it difficult to locate exact plot positions. Some burials are without headstones, and those which have weathered significantly are impossible to read. Some of this lost information may be able to be recovered from families and historical societies in the region. A photographic record and electronic register of plots, names, date of birth and death is currently kept by the local authority.

Restrictions have been placed on burials in the Serpentine Cemetery with persons needing to demonstrate a personal connection with the Shire through *Council Policy AP7 Cemeteries – Right of Burial*. This is to ensure the availability of plots for persons with close association locally. Plots can no longer be reserved within the cemeteries.

4.2 Community Participation

Community participation in the management of the Serpentine Cemetery is vital to protect their aesthetic and heritage values, and empower community members through their participation and promote awareness of natural and built heritage. Community participation is encouraged in the general maintenance of the cemetery.

The Cemeteries Management Committee was established in March 2000 by Council to provide advice for the management and development of cemeteries within the Shire. The committee participates in four-monthly meetings with the Shire staff and Council representatives and community members. At these meetings information regarding planning

and management of the reserve is exchanged by staff and the community, and representatives report on results of Serpentine Cemetery inspections.

At present community engagement is managed through community representatives' attendance at the Cemeteries Management Committee. The Reserves Advisory Group is another Council community group that provides an external role in the provision of advice relating to reserve management plans.

4.3 Economic Values

4.3.1 Business and Tourism

The values of tourism in the Serpentine Cemetery should be heightened by the visitor experience and understanding of how life was and how life is now lived by members of the Serpentine community.

Within the Serpentine Conservation Precinct, the Serpentine Historical Society occupies the Old Serpentine Bridge School. It is opened to school groups and visitors as a museum. The Serpentine Historical Society is committed to educating the community and preserving the built heritage of Serpentine. The former teacher's quarters and school building were sold by the Education Department in the 1970s and are now in private ownership.

Tourism of the Serpentine Cemetery can occur in conjunction with the local Serpentine Heritage Trail, which traverses the Conservation Precinct of the old Serpentine town site. This route is popular during spring when the wildflowers are in bloom.

The Department of Planning has forecast a major population growth for the Serpentine Jarrahdale area. Currently the business and tourism created by cemeteries in the Shire provides minimal economic benefit. However, these benefits have the potential to be realised through the Serpentine Heritage Trail route and promotion of the associated heritage values locally. The nearby Serpentine Falls and Serpentine Dam are popular tourist destinations in the area. The Serpentine Caravan Park is within 1 kilometre from the cemetery and provides an additional opportunity to promote tourist activities in the Serpentine Conservation Precinct.

Stakeholders involved in the promotion of business and tourism include:

- Peel Region Tourism Association
- Peel Development Commission
- Western Australian Tourism Commission
- Serpentine Business and Tourism Association
- Department of Parks and Wildlife

4.3.2 Infrastructure

The Serpentine Cemetery consists of a built area and an area of remnant bushland. In addition to graves and monuments, other infrastructure on site includes constructed pathways and drainage, an ablution block, parking area, driveway, memorial wall, boundary fencing, signage, seating and associated landscaping and artwork.

Visitor parking is provided on the north end of the cemetery, although this is sometimes inadequate. During large funeral events. Emergency access way requirements in the event of a fire will also need to be taken into consideration along Cemetery Road. During larger ceremonies the Serpentine River Reserve parking bay, the stone building on the other side of the Serpentine River and Saint Stephen's Church parking area are used. Informal tracks for maintenance and burials in the cemetery are approximately 4 metres wide and provide for one way traffic only. Only maintenance vehicles, hearses and vehicles following the hearses are permitted into the cemetery.

Historically, pedestrian access has been via the maintenance tracks. A bitumen pathway travelling west along the western boundary of the cemetery reserve adjacent the South Western Highway provides pedestrian access. A sign along this pathway directs visitors to an upgraded concrete pathway which is accessible for disabled persons.

The burial plots are in a grid pattern and sufficient space is allowed between each grave for viewing. It is proposed in the future that the tracks within the cemetery may be filled with gravel to enhance the aesthetics and define the pathways.

The memorial niche wall at the northern point of the cemetery consists of a brick wall and a concrete flooring and is used to contain ashes. The wall is maintained to ensure a neat and tidy appearance and residents are encouraged to consider this as an alternative option to burial, considering the limits of available burial plots. This area is also accessible for disabled persons.

The land is sloping, and surface water is controlled via a constructed drainage system along the eastern boundary of the reserve.

The ablution block is a zincalume building painted green on a concrete pad. It contains of a male and female toilet with disabled access.

The Serpentine Cemetery is fenced on the western boundary with a post and wire fence with chain gates at each entrance. Historically, these gates have been left open and are now locked for security purposes.

The Serpentine Historical Society has proposed that interpretive and directional signage be placed at the Serpentine Cemetery so that visitors and loved ones may be guided in locating graves.

There are several wooden park benches in selected locations providing places to sit and rest in the cemetery. These seats deteriorate over time and require ongoing maintenance so increasing or replacing these seats will need to take into consideration life cycle costs and oiling or painting requirements. Benches made out of a composite materials including both

recycled plastic and timber are emerging on the market which are promising to deliver on both the values of sitting on wood and the longer life cycle values of recycled plastic.

4.3.3 Conservation of the Built Environment

Monuments

Depending on the construction material of the monument, different elements are subject to natural weathering and decay. Granites, depending on whether they are polished or not, maybe susceptible to lichen, which may, over time, accelerate degradation. Marble is easily scratched, and is slightly soluble in water, which may cause marble monuments to become rounded. Wooden monuments are the most susceptible to decay.

Inscriptions record the genealogical information such as birth and death, and sometimes family relationship inscriptions may include historical information such as death circumstance, and the style of text may reflect community and religious attitudes at the time. The natural processes of weathering have made some inscriptions hard to read.

An occasional request is received to import a monument to the Cemetery. If the monument and associated person is of local heritage significant relocations may be considered. This should be assessed on individual merit by the relevant authority in consultation with the relatives.

Vandalism / Mechanical Damage

Vandalism has been an issue in the Serpentine Cemetery in the past. The reserve is a public open space area, however, regular visitors to the site may act as a deterrent to vandalism.

Caution is taken when heavy machinery is brought into the reserve for grave digging or maintenance and repair.

4.4 Social and Economic Recommendations

Table 5 – Social and Economic Recommendations

No	Strategy	Priority	Implementation	Responsibility	Cost Estimates	Notes
Social and Economical Characteristics						
Infrastructure						
21	Establish historic photo point monitoring locations and Interpret natural, cultural and aboriginal heritage and history of the site in a brochure and within an Interpretive Shelter.	High	Not Yet Implemented	Community and Shire	\$10,000 for a shelter and its interpretive design and sign creation	Each year in same place.

No	Strategy	Priority	Implementation	Responsibility	Cost Estimates	Notes
22	Continue to seek input from Noongar groups in the implementation of this plan.	High	Not Yet Implemented	Community and Shire	Staff time \$1,000	
23	Maintain facilities and the natural and built forms in the cemetery for visitor enjoyment.	Medium	Implemented in Part	Operations, Parks and Natural Reserves Coordinator	Staff Time \$1,000	
24	Integrate and designate path networks, for amenity and maintenance.	High	Implemented in Part	Operations, Parks and Natural Reserves Coordinator	Staff Time \$2,000	
25	Continue to provide access to the cemetery for people with disabilities.	Medium	Implemented in Part	Operations, Parks and Natural Reserves Coordinator	Staff Time \$3,000	
Recreation						
26	Encourage, support and facilitate connectivity to heritage walk trail networks and associated community groups with ongoing participation in the management of the reserve.	High	Implemented in Part	Environmental Services and Natural Reserves Coordinator	Staff Time \$1,000	
Implementation, Monitoring and Review						
27	Periodically monitor and review the efficiency and effectiveness of management plan strategy implementation and review and revise as necessary.	High	Yet to be implemented	Environmental Services Operations, Parks and Natural Reserves Coordinator	Staff Time \$1,000	
28	Secure an annual budget allocation to implement this management plan.	High	Yet to be implemented	Environmental Services Operations, Parks and Natural Reserves Coordinator	Staff Time \$1,000	
29	Encourage, support and facilitate the Cemeteries Management Committee, volunteers and wider community to provide ongoing participation in the management of the reserve.	Key	Ongoing	Environmental Services, Natural Reserves Coordinator, Engineering Support Officer	Staff Time \$1,000	
30	Continue to investigate alternative funding sources.	High	Yet to be implemented	Environmental Services Operations, Parks and Natural Reserves Coordinator, Engineering Support Officer	Staff Time \$1,000	

No	Strategy	Priority	Implementation	Responsibility	Cost Estimates	Notes
31	Encourage and Support locality grant submissions from the general community.	Medium	Implemented in Part	Environmental Services Operations, Parks and Natural Reserves Coordinator, Engineering Support Officer	Staff Time \$1,000	
32	Consider an application for a water grant to install a water tank and water use reduction devices within the Cemetery Reserve.	Medium	Yet to be implemented	Environmental Services Operations, Parks and Natural Reserves Coordinator, Engineering Support Officer	Staff Time \$1,000	

5. Implementation

5.1 Implementation Plan

Divisions within the Shire with responsibilities for implementation sometimes in collaboration with the Landcare, Fire Brigade or Community are as follows:

- Engineering Services
 - Operations, Parks
 - Natural Reserves Coordinator
 - Environmental and Sustainability Services
 - Engineering Support Officer
- Corporate and Community
 - Community Development
- Development Services Directorate
 - Planning
 - Building
 - Health
 - Ranger Services
 - Fire and Emergency Services
 - Bushfire Brigades

Table 6 – Implementation Table

No	Strategy	Priority	Implementation Status	Responsibility	Cost Estimates	Notes
Governance						
1	Change of reserve purpose to include Conservation along with the current purposes of Public Recreation, Public Open Space and Public and Community Purposes.	Key	Yet to be implemented	Environmental Services	Staff Time \$1,000	Within 3 months of completion of plan
2	Fulfil obligations under all relevant legislation including the Native Title Act 1993.	High	Ongoing	Environmental Services	Staff time \$1,000	
3	Maintain active liaison with the Cemetery Committee via four-monthly meetings and review the role and composition of the group periodically.	High	Implemented in part	Environmental Services	Staff time \$1,000	

No	Strategy	Priority	Implementation Status	Responsibility	Cost Estimates	Notes
Environmental Characteristics						
Land Resources						
4	Include gravel surface over walkways to prevent wind erosion to increase the aesthetic value of the cemetery.	Medium	Not Yet Implemented	Engineering Services	Staff Time \$1,000	
Water Resources						
5	Consider an asphalt driveway to enhance the overall appearance of the cemetery and to address the onsite drainage water moving into existing drainage infrastructure.	Medium	Not yet Implemented	Engineering Services	Staff Time \$1,000	
Fire						
6	Liaise with the Emergency Service Officers to put in place a Fire Management Plan for the Reserve, including a Response Plan.	Key	Ongoing	Emergency Services	Consultant \$3,000	
7	Carry out fuel reduction burns in consultation with the Department of Parks and Wildlife to protect specific biodiversity values and so as to create a mosaic of burning regimes resulting in maximising biodiversity opportunities.	High	Implemented in Part	Fire and Emergency Services Voluntary Bushfire Brigade each year	Staff time \$1,000	Mosaic burning regimes are best achieved through a combination of small protection fuel reduction burns done through a variety of seasons and conditions along with containment of any small unplanned burns.
8	Follow up any burning with weed spraying, as fire promotes new weed species growth, and replacement with native plants.	High	Implemented in Part	Natural Reserves Coordinator and Operations	Contractor \$3,000	Removal of weeds opportunistically following on from planned or unplanned burns.
Dieback						
9	Carry out phosphite injections in trees presenting early signs of infection.	High	Not yet Implemented	Operations Parks and Natural Reserves Coordinator	About \$0.50 per tree \$1,000	
10	Practice dieback hygiene including restricting materials brought onsite to be dieback	High	Implemented in Part	Operations Parks and Natural Reserves	Staff Time \$1,000	

No	Strategy	Priority	Implementation Status	Responsibility	Cost Estimates	Notes
	free only and consider signage and an associated boot cleaning station while monitoring the effect and spread of dieback within the reserve.					
Weeds						
11	Strategically remove weeds, particularly <i>Watsonia</i> from the Bush Forever Site 371 which is on local government reserve.	Key	Ongoing	Environmental Services and Community	Contract spraying – Every two or three years \$2,000 worth of weed spraying will be necessary averaging out to about \$500 a year.	
12	Review annually and implement a Weed Control Plan that maps and identifies weed species, vegetation condition and dieback presence within the reserve, and identifies priority areas and appropriate techniques and strategies to reduce weed density and weed seed sources.	High	Implemented in Part	Environmental Services Operations Parks and Natural Reserves Coordinator	Staff Time \$1,000	
Revegetation						
13	Use nearby local vegetation communities as a guide to the local flora when revegetating the reserve.	High	Implemented in Part	Operations Parks and Natural Reserves and Community	Staff Time \$1,000	
14	Plant a variety of understorey vegetation, which will provide fire safe adequate bandicoot habitat, while slowly removing <i>Watsonia</i> and other weeds.	High	Not Yet Implemented	Operations Parks and Natural Reserves Coordinator	Staff Time \$1,000	
15	Formalise and restrict access to the memorial niche wall in order to protect in particular remnant vegetation.	Medium	Implemented in Part	Operations Parks and Natural Reserves Coordinator	Staff Time \$1,000	
Biodiversity						
16	Monitor the recovery of plant communities after fire and use this information in plan reviews and revisions so low flammability local native species can be included in future plantings.	High	Not yet Implemented	Environmental Services Operations Parks and Natural Reserves Coordinator	Staff Time \$1,000	
17	Identify and quote to remove all non-local trees and	Medium	Implemented in Part	Operations, Parks and Natural	Staff Time \$1,000	

No	Strategy	Priority	Implementation Status	Responsibility	Cost Estimates	Notes
	shrubs from the reserve particularly invasive ones.			Reserves Coordinator		
18	Regularly monitor and record feral animals around the reserve. Undertake control programs when needed.	Medium	Yet to be Implemented	Operations, Parks and Natural Reserves Coordinator in conjunction with Landcare	Staff Time \$1,000	
19	Advise all local residents of the impacts dogs and cats on the reserve fauna.	High	Yet to be Implemented	Environmental Services and Landcare	Staff Time \$1,000	
20	Develop a public awareness, appreciation and understanding program that targets local landowners and users of the reserve, to consider the value of flowering species in the reserve, impacts of weeds and the importance of good planning to protect the reserve from wildfire.	Key	Yet to be implemented	Environmental Services, Operations (Parks), Natural Reserves Coordinator and Landcare	Staff Time \$1,000	

No	Strategy	Priority	Implementation	Responsibility	Cost Estimates	Notes
Social and Economical Characteristics						
Infrastructure						
21	Establish historic photo point monitoring locations and Interpret natural, cultural and aboriginal heritage and history of the site in a brochure and within an Interpretive Shelter.	High	Not Yet Implemented	Community and Shire	\$10,000 for a shelter and its interpretive design and sign creation	Each year in same place.
22	Continue to seek input from Noongar groups in the implementation of this plan.	High	Not Yet Implemented	Community and Shire	Staff time \$1,000	
23	Maintain facilities and the natural and built forms in the cemetery for visitor enjoyment.	Medium	Implemented in Part	Operations, Parks and Natural Reserves Coordinator	Staff Time \$1,000	
24	Integrate and designate path networks, for amenity and maintenance.	High	Implemented in Part	Operations, Parks and Natural Reserves Coordinator	Staff Time \$2,000	
25	Continue to provide access to the cemetery for people with disabilities.	Medium	Implemented in Part	Operations, Parks and Natural Reserves Coordinator	Staff Time \$3,000	

No	Strategy	Priority	Implementation	Responsibility	Cost Estimates	Notes
Recreation						
26	Encourage, support and facilitate connectivity to heritage walk trail networks and associated community groups with ongoing participation in the management of the reserve.	High	Implemented in Part	Environmental Services and Natural Reserves Coordinator	Staff Time \$1,000	
Implementation, Monitoring and Review						
27	Periodically monitor and review the efficiency and effectiveness of management plan strategy implementation and review and revise as necessary.	High	Yet to be implemented	Environmental Services Operations, Parks and Natural Reserves Coordinator	Staff Time \$1,000	
28	Secure an annual budget allocation to implement this management plan.	High	Yet to be implemented	Environmental Services Operations, Parks and Natural Reserves Coordinator	Staff Time \$1,000	
29	Encourage, support and facilitate the Cemeteries Management Committee volunteers and wider community to provide ongoing participation in the management of the reserve.	Key	Ongoing	Environmental Services, Natural Reserves Coordinator, Engineering Support Officer	Staff Time \$1,000	
30	Continue to investigate alternative funding sources.	High	Yet to be implemented	Environmental Services Operations, Parks and Natural Reserves Coordinator, Engineering Support Officer	Staff Time \$1,000	
31	Encourage and Support locality grant submissions from the general public.	Medium	Implemented in Part	Environmental Services Operations, Parks and Natural Reserves Coordinator, Engineering Support Officer	Staff Time \$1,000	
32	Consider an application for a water grant to install a water tank and water use reduction devices within the Cemetery Reserve.	Medium	Yet to be implemented	Environmental Services Operations, Parks and Natural Reserves Coordinator, Engineering Support Officer	Staff Time \$1,000	

Appendix 1 – Flora Detail

Serpentine Cemetery Reserve (R10661) 2012

One permanent monitoring quadrat was set up on 26/11/08. This was resurveyed on 20/10/09 (but moved due to *Watsonia* encroachment), and additional species from near the quadrat were added to the list. The 2009 species count from the quadrat was 9% less than in 2008 (possibly related to weed invasion), but the total number of species recorded (including those from outside the quadrat) was 24% greater. The number of recorded weed species also increased.

Subsequent surveys have occurred and indications are that weed species are getting worse rather than better and annual weed control should occur as a priority in this reserve.

General comments: The natural area of Serpentine Cemetery Reserve has high biodiversity value and a high degree of threat from weed invasion. There are a significant number of invasive weed species as well as other introduced weed plant species which need to be kept in check.

Flora List for Monitoring Quadrat in Serpentine Cemetery Reserve (number refers to year of survey)

Plant species	Quadrat A	Nearby	Quadrat B
* <i>Acacia longifolia</i>			10, 12
<i>Acacia pulchella</i>	12	09, 10	
<i>Acacia urophylla</i>		10, 12	
<i>Agrostocrinum hirsutum</i>	09, 10, 12		10, 12
* <i>Aira cupaniana</i>	08, 09		
<i>Allocasuarina humilis</i>	12	09, 10	
* <i>Anagallis arvensis</i>	09, 10, 12		
<i>Anigozanthos bicolor</i>	09, 10		
<i>Anigozanthos manglesii</i>	08, 09, 10, 12		
* <i>Arctotheca calendula</i>	12		
<i>Austrodanthonia acerosa</i>	08, 09, 10		
<i>Austrostipa elegantissima</i>			10, 12
<i>Austrostipa semibarbata</i>	08, 09, 10		
<i>Baeckea camphorosmae</i>	08, 09	10, 12	
<i>Banksia grandis</i>		09, 10, 12	
<i>Banksia nivea</i>	08, 09, 10, 12		10, 12
<i>Bossiaea eriocarpa</i>	12		
* <i>Briza maxima</i>	08, 09, 10, 12		
* <i>Briza minor</i>	08, 09, 12		
<i>Burchardia congesta</i>	08, 09, 10, 12		12
<i>Caesia micrantha</i>	08, 09, 10, 12		10, 12
<i>Caesia occidentalis</i>	12		10, 12

Plant species	Quadrat A	Nearby	Quadrat B
<i>Caladenia flava</i>	12		
<i>Cassytha glabella</i>			10
<i>Chamaescilla corymbosa</i>	08, 09, 10, 12		
<i>Conostylis setigera</i>	08, 09, 10, 12		
<i>Corymbia calophylla</i>	08, 09, 10, 12		10, 12
* <i>Cotula turbinata</i>	12		
<i>Cyathochaeta avenacea</i>	12	09, 10	10, 12
<i>Dasypogon bromeliifolius</i>	08, 09, 10, 12		
<i>Daviesia nudiflora</i>	08, 09, 10, 12		
<i>Desmocladius fasciculatus</i>	08, 09, 10, 12		10, 12
* <i>Disa bracteata</i>	08		
<i>Drosera erythrorhiza</i>	10, 12		
<i>Drosera menziesii</i>	12		
* <i>Ehrharta calycina</i>	08, 09, 10, 12		
* <i>Eragrostis curvula</i>			10
<i>Eremaea pauciflora</i>	09, 10, 12		
<i>Eucalyptus marginata</i>	08, 09, 10, 12		
* <i>Freesia alba x leichtlinii</i>	08, 09, 10, 12		10, 12
* <i>Fumaria capreolata</i>		09	
<i>Gastrolobium</i> sp.			10, 12
<i>Gompholobium tomentosum</i>	12		
<i>Grevillea bipinnatifida</i>	08, 10	09	10, 12
<i>Haemodorum brevisepalum</i>			12
<i>Haemodorum laxum</i>	08, 09, 10, 12		10, 12
<i>Haemodorum spicatum</i>	08, 09, 10, 12		
<i>Hakea ceratophylla</i>			10, 12
<i>Hakea marginata</i>			10, 12
<i>Hakea ruscifolia</i>		09, 10, 12	
<i>Hakea undulata</i>		10	10, 12
<i>Hibbertia huegelii</i>	08, 12		
<i>Hibbertia hypericoides</i>	09, 10, 12		
* <i>Hypochaeris glabra</i>	08, 09, 10, 12		
* <i>Hypochaeris radicata</i>	08, 09, 10, 12		
<i>Hypolaena exsulca</i>	10		
<i>Hypolaena</i> sp.			10, 12
* <i>Ixia polystachya</i>	08, 10		
<i>Jacksonia furcellata</i>		10, 12	
<i>Kennedia prostrata</i>	08, 09	10, 12	
<i>Kingia australis</i>			10, 12
<i>Lagenophora huegelii</i>	12		
<i>Lechenaultia biloba</i>			10, 12
<i>Lepidobolus preissianus</i>		10, 12	
<i>Lepidosperma pubisquameum</i>			10, 12
<i>Lepidosperma scabrum</i>	08, 10, 12		
<i>Leporella fimbriata</i>	12		
<i>Leucopogon</i> sp.	08		
<i>Lobelia rhytidosperra</i>	08		
<i>Lomandra caespitosa</i>	08, 12		
<i>Lyginia imberbis</i>	09	10, 12	

Plant species	Quadrat A	Nearby	Quadrat B
<i>Macrozamia riedlei</i>		09, 10, 12	
<i>Mesomelaena pseudostygia</i>	08, 09, 10, 12		
<i>Mesomelaena tetragona</i>	08, 09, 10, 12		10, 12
<i>Microtis media</i>			10, 12
<i>Neurachne alopecuroidea</i>	08	09, 10, 12	
<i>Nuytsia floribunda</i>	10, 12	09	
<i>Opercularia vaginata</i>			12
* <i>Oxalis</i> spp.		09, 10	12
<i>Patersonia occidentalis</i>			10, 12
* <i>Petrorhagia dubia</i>	08, 09, 10, 12		
<i>Phyllanthus calycinus</i>	08, 09, 10, 12		
<i>Podolepis gracilis</i>	12	09, 10	
* <i>Romulea flava</i>	12	09, 10	12
* <i>Romulea rosea</i>	12	09, 10	12
<i>Schoenus clandestinus</i>	12		
<i>Schoenus subbarbatus</i>	12		
* <i>Silene gallica</i>	08, 09, 12	10	
* <i>Sonchus oleraceus</i>	08, 09, 10		
<i>Sowerbaea laxiflora</i>	09, 10, 12		12
<i>Stirlingia latifolia</i>			10, 12
<i>Synaphea petiolaris</i>			10, 12
<i>Tetraria australiensis</i>	12		10, 12
<i>Tetraria octandra</i>	09, 10, 12		10, 12
<i>Thelymitra crinita</i>	10, 12		12
<i>Thysanotus manglesianus</i>	08, 09, 10, 12		12
<i>Thysanotus sparteus</i>			10, 12
<i>Thysanotus triandrus</i>	08, 09, 10, 12		
<i>Thysanotus</i> sp.	08		
<i>Trachymene pilosa</i>	09, 12		
<i>Trichocline spathulata</i>	08, 10		
<i>Tricoryne elatior</i>	08, 12	10	10, 12
* <i>Ursinia anthemoides</i>	08, 09, 10, 12		
<i>Verticordia densiflora</i>			10, 12
* <i>Watsonia meriana</i>	08, 09, 10, 12		10, 12
<i>Xanthorrhoea preissii</i>	08, 09, 10, 12		10, 12
<i>Xanthosia huegelii</i>	12	10	10, 12
* <i>Zantedeschia aethiopica</i>		09, 10, 12	

* Introduced species