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1.0 Introduction

The Shreeve Road Reserve Wetland (SRRW) is a 12.5 hectare seasonal Conservation management category wetland located within a residential setting in Canning Vale. It is managed, with the exception of 1.3 hectares in private ownership, by the City of Gosnells. The management and suppression of fire has been identified by the City as critical to the protection of the SRRW's high conservation values.

The City engaged Ecoscape Australia in 2007 to prepare a scoping report on the management and suppression of fire in the SRRW. Ecoscape's report has directly informed the development of this Fire Management Action Plan (FMAP).

The FMAP provides supporting information on ecological, legislative and policy aspects of the SRRW. It sets out specific prioritised actions to address fire management issues within the SRRW, and identifies stakeholders in the implementation of the FMAP. The implementation of the FMAP relies on an integrated and adaptive approach based on generating shared values and behaviour in managing fire within the SRRW.

SRRW has significant conservation value for both flora and fauna. It was determined in 1999 by the Environmental Protection Authority and subsequent Ministerial Statement 502 on the City of Gosnells' Town Planning Scheme Amendment number 478 to be set aside and managed for the purpose of conservation.

Surrounding urban development and residential activity bring new pressures to "island" conservation areas such as the SRRW. Their sustainability is impacted by factors associated mainly with their size and isolation, one of which is fire.

Fire is recognised, given a "normal" scenario, as an integral component of most Australian ecosystems. In an "abnormal" scenario, however, fire events have the potential to be too frequent and/or intense, posing a serious threat to the long-term ecological sustainability of an isolated remnant natural area.

Fire is by definition an ecosystem disturbance event which, particularly in an urban context, creates opportunities for weed invasion and degradation through trampling of regenerating vegetation. Weed invasion and spread, especially of flammable grassy weeds, can affect the frequency and intensity of fire events. Whilst the risks associated with bushfire to the adjacent suburban community are low they have also been appropriately addressed within this Plan.

Through integrated and adaptive management, this Plan aims to minimise environmental risks and consequences associated with fire.

2.0 Fire Management Objectives

The overall objectives of this Action Plan are to ensure that the conservation value of the Reserve is not compromised by fire and that the risk presented by fire in the Reserve to City of Gosnells infrastructure and to the surrounding built environment and community is understood and minimised. The broad objectives of the Action Plan are:

1. To preserve the Reserve's biodiversity value by preventing the occurrence of unplanned bushfires
2. To preserve the Reserve's biodiversity value by reducing the potential impact of bushfire
3. To preserve the Reserve's biodiversity value by providing for informed post fire management of a regenerating ecosystem
4. To raise the adjoining residential community's awareness of bushfire and the role they can play in its prevention and management

3.0 Key stakeholders and their roles

The key stakeholders in the management of fire and its impacts in the Reserve are the Fire and Emergency Services Authority (FESA), the City of Gosnells and the community.

FESA supports:

- The Fire and Rescue Service (FRS), which combats fires in urban areas impacting on man-made structures, bushland, trees, rubbish and the like.
- Volunteer Bush Fire Brigades, which are established by local governments and are responsible for suppressing fires in rural areas in bushland and on agricultural properties.

FRS' fire management role at the Reserve includes:

- The planning and implementation of response strategies.
- Responding to fire reports.
- Providing advice to the City of Gosnells on aspects of fire management.
- Fire planning, including prevention, preparedness, response and recovery.
- Fire suppression.

The City of Gosnells' role, as the manager of the Reserve, includes:

- Fire management planning.
- Implementation of prevention, preparedness and recovery strategies.
- Maintaining the integrity of perimeter fencing.
- Monitoring and management of fire hazards such as grassy weeds.
- Supporting the Volunteer Bush Fire Brigade, which may attend a fire at the Reserve.

The adjoining residential community's role, as neighbours of the Reserve, includes:

- Reporting suspicious or unlawful activity in the Reserve.
- Reporting fire in the Reserve.
- Being aware of the risk of fire in the Reserve, and of risk reduction strategies for their properties.

4.0 Shreeve Road Reserve Wetland Environmental Overview

4.1 Location

SRRW is a 12.5 hectare seasonal wetland bounded by Waterperry Drive and Shreeve Road, Canning Vale. It is predominantly in public ownership as Crown Reserves 38134 and 47209, with Management Orders in favour of the City of Gosnells. Approximately 1.3 hectares remain in private ownership on Lot 1 Shreeve Road (Figure 1).

4.2 Geology and topography

SRRW is located on the eastern side of the Swan Coastal Plain, over the Bassendean Dune System. Typically the Bassendean Dune System comprises low hills of leached siliceous sand and wetland areas in the interdunal swales. The eastern portion of the Reserve comprises peat–rich sand which is subject to periodic flooding. The western portion comprises peaty sand associated with swamps and seasonal waterlogging. The depth of peat in most areas of the Reserve is estimated to be between 100mm-50mm (Ecoscape 2007).

Topographical information indicates that the SRRW is essentially flat and lies roughly between 18mAHD and 19mAHD.

4.3 Relevant environmental policy and legislation

SRRW is identified as a Conservation management category dampland (seasonally waterlogged basin) in the Department of Environment and Conservation's Geomorphic Wetlands Swan Coastal Plain dataset (DEC, 2007c). The management classification means that this wetland has a high degree of naturalness with a management priority directed towards enhancing the natural features of the wetland (EPA, 2005).

Subsequent to formal Environmental Impact Assessment of the City of Gosnells' Town Planning Scheme Amendment 478 (EPA Bulletin 921), the SRRW was one of five Conservation management category wetlands in the Amendment area to be determined by the Minister for the Environment (Statement 502, 12 April 1999) to be set aside for the purpose of conservation.

The vegetation of the Reserve is protected through the *Environmental Protection (Clearing of Native Vegetation) Amendment Regulations 2007*, under which it is an offence to clear native vegetation. "Clearing" is defined in the Regulations as causing substantial damage to native vegetation. This includes:

- the killing or removing of native vegetation;
- the severing or ringbarking of trunks or stems;
- the draining or flooding of the land;
- the burning of vegetation;
- the grazing of stock; or
- any other activity that kills or damages native vegetation.

The Reserve's vegetation is also protected by the *Land Administration Act 1997*, which provides that it is an offence, without permission from the Minister for Lands or reasonable excuse, to clear Crown land. Another control is found in the *Wildlife Conservation Act 1945*, which prohibits the clearing of indigenous flora on Crown land. In all matters, though, the *Environmental Protection Act 1986*, and its Regulations, prevails.

4.4 Dieback

Limited assessment for dieback disease (*Phytophthora cinnamomi*) was carried out by the City of Gosnells in May 2006 to determine the cause of death of a number *Allocasuarina fraseriana* trees along the south-west side of the Reserve. Soil and tissue samples were analysed. Results were negative, but not considered conclusive due to sampling factors (Glevan, 2006). It is recommended that dieback hygiene management procedures are incorporated into all works and activities undertaken in SRRW to prevent the introduction and/or spread of the disease.

4.5 Climate

The SRRW area experiences mild wet winters and hot dry summers. The hottest months are January and February and rain falls predominantly in the winter months (Av: 800mm per annum). Prevailing winds consist of moderate south-easterly winds in the morning with a moderate south-westerly in the afternoon during summer months with north-westerly to Southerly during winter months.

4.6 Biodiversity

The Reserve has very high conservation value as it is a significant remnant wetland on the extensively cleared Swan Coastal Plain. The variety of vegetation in the Reserve, its physical shape and the condition of its vegetation support its high conservation value. Consequently, the Reserve has considerable value for conservation of flora and, in the absence of specific study, a strong likelihood that it has high conservation value for fauna (Trudgen and Keighery, 1995). 37 bird species were recorded in the Reserve during a 6-month survey by Birds Australia (Gole, 2003). The dense scrub vegetation is also recognised as preferred habitat for the Southern Brown Bandicoot, a Priority 5 fauna species that has been observed foraging on grassed areas adjoining the Reserve.

The Reserve has recently been ranked by the City through its Biodiversity Planning Project (in progress) as having the eighth highest management priority of the 38 natural areas owned or managed by the City.

4.7 Fire History

It is understood that the majority of SRRW has not been impacted by fire for up to 25 years, a fact that is supported by high fuel loads across the Reserve. There is, though, no record of fire history for the Reserve.

Figure 1: Site Location (Ecoscape, 2007)

5.0 Key Issues for Shreeve Road Reserve Wetland and its Management

5.1 Fire Management

5.1.1 Fire Hazard Risk Rating

The Reserve was evaluated by Ecoscape (2007) as having a High to Extreme fire hazard risk rating. The assessment was based on physical characteristics such as fuel arrangement, fuel load, condition of herbaceous vegetation, and presence of elevated fuels. Ecoscape's mapping of the Reserve according to the level and type of hazard risks ratings is provided in Figure 3. The ratings correspond to the vegetation structures shown in Figure 2. Ecoscape used the Bushfire Classification Method as defined by FESA (2001) who identifies four levels of bush fire hazard: Low, Medium, High and Extreme. The level of bush fire hazard indicates the likely intensity of a bush fire.

Extreme Hazard Risk: The northern half the Reserve, dominated by *Melaleuca rhaphiophylla* dense thicket, is rated as an Extreme Hazard Risk due to the heavy fuel load present in the canopy.

High Hazard Risk: The balance of the Reserve's naturally vegetated area was rated as High Hazard Risk. This includes the wetland areas of the *Hakea varia* shrubland and *Melaleuca preissiana* woodland, both having significant fuel loads close to the ground in the form of low shrubs and sedges. The western corner, consisting of *Eucalyptus todtiana* woodland, was also rated as High Hazard Risk due to the significant fuel load in the larger shrubs and trees.

Medium Hazard Risk: The buffer includes a mix of natural landscaping and managed turf areas and artificial water bodies. The landscaping surrounding the artificial water bodies, consisting of locally endemic species, effectively constitutes an open shrubland and was rated as Medium Hazard Risk.

Low Hazard Risk: Artificial waterbodies and grassed areas on the perimeter of the Reserve are considered to pose no fire hazard and were subsequently rated as having a Low Hazard Risk.

5.1.2 External Factors Contributing to Fire Hazard Risk Rating

5.1.2.1 Change in wetland hydrology

It should be noted that the hydrology of the site has changed in recent years due to poor design and construction of artificial lakes on the south-western side of the Reserve within the buffer, resulting in seepage into the dampland. This is likely to be the cause of the recently observed increase in depth and duration of surface water within the Reserve (pers. comm. G Bremner). *Allocasuarina fraseriana* and *Pericalymma ellipticum* have been observed to be dying, most likely, due to soil moisture exceeding those species' tolerances. This vegetation death contributes to the fire ignition risk of the site: the dead foliage and branches add to the fuel load as standing biomass, or as ground litter. It is critical to the ongoing management of fuel load that the issue of changed hydrology is investigated.

It is recommended that the City of Gosnells regularly monitor the health of vegetation in the area affected by changed hydrology for plant deaths and increased fire hazard from standing biomass.

It is similarly important that the evolution of vegetation in the areas disturbed as a result of altered hydrology is monitored. It is common for environmental weeds to colonise such areas. These may contribute to change in the Fire Hazard Risk rating for the area, particularly if grassy annual weeds are allowed to establish and dominate.

It is recommended that the City of Gosnells regularly monitor the affected area for weed incursion, and take appropriate management action, which should include weed control, but not exclude revegetation/rehabilitation with appropriate species.

It is also recommended that the City seek to determine the cause of seepage from these artificial waterbodies with a view to quantifying its impact on native vegetation, and develop a means of remediating the problem, should it be determined to have a measurable negative impact on the vegetation.

Action 1 (5.1.2.1): It is recommended that the City of Gosnells regularly monitor the health of vegetation in the area affected by changed hydrology for plant deaths and increased fire hazard from standing biomass.

Action 2 (5.1.2.1): The City of Gosnells to regularly monitor areas on the south-western side of the Reserve, adjacent to and impacted by seepage from artificial waterbodies, for weed incursion, and to take appropriate management action, which should include weed control, but not exclude revegetation/ rehabilitation with appropriate species.

Action 3 (5.1.2.1): The City of Gosnells to seek to determine the cause of seepage from artificial waterbodies on the south-western side of the Reserve, with a view to quantifying its impact on native vegetation, and to develop a means of remediating the problem, should it be determined to have a measurable negative impact on the vegetation.

Figure 2: Vegetation Structure (Ecoscape, 2007)

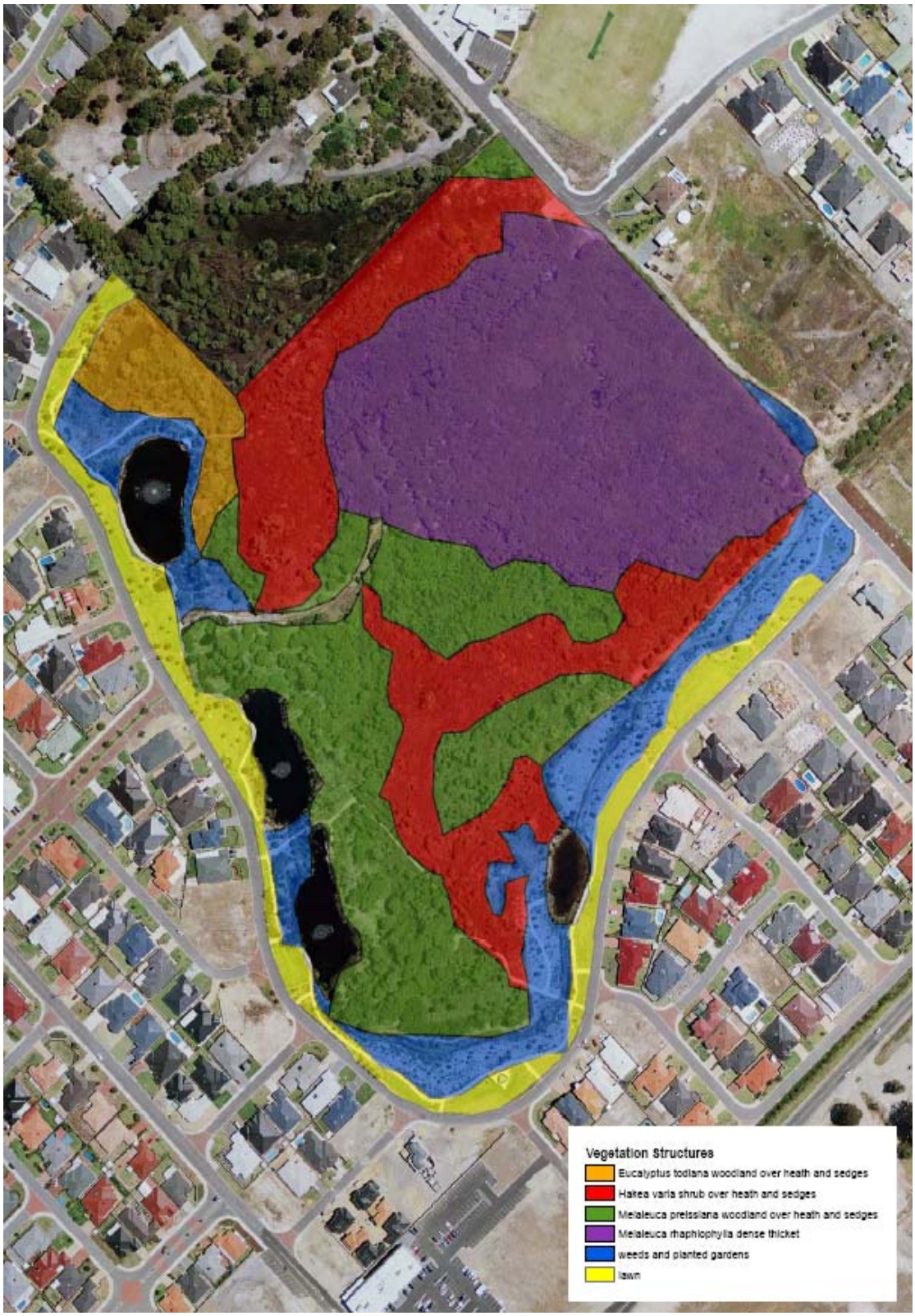

Figure 3: Fuel Loads and Hazards (Ecoscape, 2007)

Figure 4: Fire Important Weeds in Shreeve Reserve Wetland (Ecoscape, 2007)

5.1.2.2 Weed Management

Six environmental weed species were identified by Ecoscape (2007) as key species in fire management, and broadly mapped (Figure 4). These weeds are important as either:

- a source of ignition,
- contributing to the fuel load,
- becoming post-fire dominant by colonising and dominating a site at the expense of native vegetation recruitment after fire, and/or
- presenting an obstruction, preventing personnel accessing certain areas.

Table 1: Environmental weeds – fire-related aspects

Species	Common Name	Fire Hazard risk		Post Fire	Obstructive
		Ignition	Fuel load	Dominant	
Acacia longifolia	Sydney Golden Wattle		*	*	
Cortaderia selloana	Pampas Grass	*			
Cuscuta campestris	Golden Dodder	*			*
Rubus sp.	Blackberry			*	*
Schinus terebinthifolia	Japanese Pepper		*		
Typha orientalis	Bulrush	*	*		

It is recommended that high fire ignition risk sources be reduced through the physical removal of standing dead biomass of species such as Pampas Grass and *Acacia longifolia.* This work is addressed in the Shreeve Road Reserve Wetland Management Plan (City of Gosnells, 2006).

Action 4 (5.1.2.2): The City of Gosnells to maintain weed control work as guided by Shreeve Road Reserve Wetland Management Plan (2006) and Shreeve Road Reserve Wetland Fire Management Plan or future mapping exercises, focusing as required on the reduction of high fire ignition risk sources through the physical removal of standing dead biomass of species such as Pampas Grass and *Acacia longifolia.*

Comprehensive weed mapping and vegetation condition mapping of the Reserve has not been undertaken at this time. This information is crucial for informing appropriate post fire recovery management target areas to reduce the risk of degradation of vegetation condition through weed invasion.

It is recommended that the City of Gosnells undertake weed and vegetation condition mapping for the Reserve and ensure that it is maintained to provide current weed and vegetation condition information.

Action 5 (5.1.2.2): City of Gosnells undertake weed and vegetation condition mapping for the Reserve and ensure that it is maintained to provide current weed and vegetation condition information.

5.1.3 Hazard Reduction Programmes

Hazard reduction programs aim to reduce the severity of bushfires by reducing fuel load and ignition sources. This is commonly achieved through fuel reduction burning programmes or manual removal of a fuel.

A site inspection of the Reserve on 9 June 2007 by the Gosnells Fire Control Officer and the Captain of the Gosnells Volunteer Bush Fire Service determined that a prescribed burning programme would not be appropriate due to the vegetation structure and limited access within the densely vegetated dampland. The likelihood of an ensuing peat fire, which is very difficult to extinguish, also supports this decision.

It is recommended that prescribed burning not be undertaken as a means of managing fuel loads in the Reserve.

Action 6 (5.1.3): The City of Gosnells to ensure that prescribed burning is not undertaken as a means of managing fuel loads in the Reserve.

5.1.4 Unauthorised Onsite Activities

Children have constructed, and continue to construct 'cubby' areas within the Reserve (pers. comm. G Bremner). These have been observed to invariably contain a variety of flammable material including furniture foam, plastics and timber. Activities of concern in fire management have also been observed at these sites, including the lighting of campfires, smoking of cigarettes and use of sparklers. These areas and activities have very high potential as ignition sites for fires through inadvertent or malicious fire setting.

It is recommended that the City of Gosnells maintain its regular inspection regime, particularly into less accessible portions of the Reserve, and remove all materials associated with the construction of 'cubby' areas.

Action 7 (5.1.4): The City of Gosnells to maintain its regular Reserve inspection regime, particularly into less accessible portions of the Reserve, and remove all materials associated with the construction of 'cubby' areas within the Reserve.

5.1.5 Access

5.1.5.1 Fire Access

There are no fire management tracks to the interior of the Reserve to facilitate fire suppression or management. This lack of access restricts ground-based fire suppression to action from the Reserve perimeter only. The lack of an internal fire access track also precludes a suppression strategy that might contain a fire within a discrete section of the Reserve

The clearing of vegetation for this purpose would not be desirable as, given the vegetation type and aerial fuel load, a considerable clearing of vegetation would be required on either side of any such access track to provide sufficiently safe

fire suppression access and egress. Importantly, the *Environmental Protection (Clearing of Native Vegetation) Amendment Regulations 2007* effectively preclude the clearing of vegetation in the SRRW for the installation of fire access tracks.

There may be, however, a post-fire opportunity to maintain an acceptable access 'easement' sufficient for the safe passage of a light tender vehicle through the management of vegetation regrowth. An iterative approach to this potential opportunity should be taken by the City following evaluation of opportunities presented by a fire. Such an 'easement' would provide emergency vehicle access in the future and, possibly, managed pedestrian access within the Reserve. It is recommended that the City of Gosnells liaise with the DEC regarding this concept, and whether or not it would constitute an offence under the *Environmental Protection (Clearing of Native Vegetation) Amendment Regulations 2007.*

Action 8 (5.1.5.1): The City of Gosnells liaise with DEC and, in liaison with FRS and the Gosnells Bushfire Brigade, examine post-fire opportunities for the management of regrowth vegetation to provide for a safe emergency access track, which may also provide a coincidental managed pedestrian access to the Reserve's interior.

5.1.5.2 Pedestrian Access

The Reserve currently has limited formalised internal pedestrian access. A pre-existing fire access track in the southern corner of the Reserve has, at the same time as the development of the buffer, been surfaced with limestone to provide pedestrian and vehicle access.

A pre-existing fire access track is understood to provide some informal pedestrian access, running from timber decking and steps at the end of a pathway opposite Charlecote Way, along the cadastral boundary with privately-owned Lot 1 Shreeve Road, and terminating at a rural-style gate on Shreeve Road. Access is restricted due to the presence of standing water over a large portion of the path for almost the entire year. Access is also understood to be made via a similarly pre-existing cleared area associated with a relictual open drain, penetrating some 150 metres into the Reserve from opposite Welbeck Road.

"Cubby" and other unauthorised activity occurs in areas of the Reserve away from these two sites, in areas supporting dense vegetation and with very limited access, affording concealment for such activities. Managed access to the wetland proper would provide one means of addressing this circumstance through passive surveillance.

It is recommended that the City of Gosnells explore opportunities for providing managed access to the wetland proper to improve passive surveillance. Appropriate and well designed access also aids to further public awareness and community conscience of the area.

As noted in 5.1.5.1, the *Environmental Protection (Clearing of Native Vegetation) Amendment Regulations 2007* effectively preclude the clearing of

vegetation in the Reserve. The City should seek clarification from the Department of Environment and Conservation on this matter.

Action 9 (5.1.5.2): The City of Gosnells to explore opportunities for providing managed access to the wetland proper to improve passive surveillance, and to seek clarification from the Department of Environment and Conservation on the application of *Environmental Protection (Clearing of Native Vegetation) Amendment Regulations 2007* in this regard.

5.1.6 Arson

Arson in an urban environment is recognised as a significant contributor to the cause of fires (Australian Institute for Criminology, 2006). Actions addressing bushfire arson in this Management Plan focus on behaviour change through education and raising community vigilance and awareness. Building an understanding of the problem and its consequences within the adjoining residential community and nearby school community should be central to any community awareness campaign that is developed for the Reserve. It is also important that the adjoining community is informed about the value of the Reserve and its active management by the City, and how they can contribute to fire prevention.

It is also recognised that firesetting is often undertaken by children who are unaware of, or have not considered, the consequences of their actions. Fires lit by children may be deliberate but are typically not malicious in nature (FESA, 2007). School education covering the inappropriateness of bushfires and the social and environmental ramifications of firesetting is therefore seen to be a key component in reducing the risks of arson within the Reserve. FESA have a school educational program which addresses issues associated with deliberately lit fires. FESA also offers programs and support information for broader community education on aspects of wildfire. The City should liaise with FESA to implement a coordinated approach to addressing community fire education. It is recommended that information to households be coordinated to coincide with FESA programmed school presentations in the area.

In addition to an understanding of the need for prompt reporting of fire, neighbours should be informed of the need for vigilance in the identification of arsonists. Neighbours can play an important role in noting suspicious or unusual behaviour in the Reserve, and recording details of persons and/or vehicles associated with that type of behaviour.

An early response to arson also helps to reduce the impact and extent of any fire within the Reserve through prompt fire suppression response. Neighbours should be provided information and encouraged to report fires in the Reserve with the same urgency afforded house fires by dialling ‘000’.

Action 10 (5.1.6): The City of Gosnells, in liaison with FESA, to develop and implement a strategy for the dissemination to the adjoining residential community and nearby schools of information on the Reserve, the risks presented by fire, and the role they can play in fire prevention and reporting.

5.1.7 Protection of built infrastructure

In 2008, the Fire Hazard to infrastructure within the wetland buffer was assessed in relation to the distance of infrastructure from predominant vegetation type. It is considered, due to the close proximity of heavily vegetated areas that there is a Medium Hazard Risk associated with the loss of infrastructure within the landscaped buffer areas. (pers. comm. R. Wallington).

It is considered that the average 50m buffer and adjoining roadway provide an adequate fire safety separation between the Reserve and neighbouring residential dwellings (Ecoscape, 2007). Despite the low risk, though, it is recommended that basic fire prevention measures are undertaken by neighbours to the Reserve. Wind-borne embers are known to be carried some distance by wind, and have the capacity to lodge in vulnerable areas such as filter pads on externally mounted air-conditioning units or in gutters containing combustible leaf material. The application of simple maintenance procedures and an understanding of fire behaviour would assist the Reserve's neighbours to reduce any potential risk to their property. The provision of information to the adjoining residential community, as outlined in **Action 10** (5.1.6), should include information on fire prevention for residential dwellings.

5.2 Fire Response Planning and Suppression

The SRRW is located within the Fire and Rescue Service (FRS) Gazetted Fire District. Responsibility for fire suppression falls to FRS. A bushfire fire might also be attended, as required, by the Gosnells Volunteer Bushfire Brigade.

For areas of special ecological significance, such as the SRRW, FRS undertakes Fire Response Planning in liaison with other agencies with interests in the subject site. The City of Gosnells assisted FRS to undertake a review of the existing Fire Response Plan (FRP) in 2008. The revised FRP (Appendix 1) guides FRS' suppression of any fire in the Reserve, identifying areas of special significance, location of hydrants and other site-specific aspects, ensuring that fire suppression activity is undertaken from a fully-informed perspective. The FRP improves the suppression of any fire, and ensures that the suppression activity accommodates the site's ecological sensitivities.

A number of specific updates in the 2008 FRP are aimed at ensuring preservation of the Reserve's conservation value during fire suppression operations. An adequate buffer and a lack of fire access within the Reserve lend itself to emphasis of fire suppression being placed on containment within the Reserve. The 2008 FRP advises that an emphasis should be placed on fire suppression activity that aims to reduce the fire's impact on biodiversity. Central to the achievement of this objective is aerial support.

Action 11 (5.2): The City of Gosnells to maintain ongoing liaison with FRS regarding the continual improvement of the Fire Response Plan for the Shreeve Road Reserve Wetland, and similar plans for other natural areas of ecological importance.

5.3 Post Fire Management

5.3.1 Debriefing

It is essential that all parties to the management and suppression of fire in the Reserve engage, post-fire, for a debriefing. A debriefing provides an opportunity for all parties to gain a better understanding of the dynamics of the event, and to review the implementation of the FRP and this Management Plan.

It is current FESA practice to undertake post incident debriefing of any significant bush fire event. As any significant bush fire at SRRW is likely to involve the Gosnells Bush Fire Brigade it is considered appropriate that the City of Gosnells actively pursue and be involved in any such post incident analysis.

Action 12 (5.3.1): The City of Gosnells, through its involvement of the Gosnells Volunteer Bush Fire Brigade, actively encourage and participate in the conduct of a Post Incident Analysis involving all stakeholders.

5.3.2 Record keeping

The attending primary brigade is responsible for the completion of a Fire Incident Reporting System (FIRS) Report Form. The form collates various data including:

- an estimate of area damaged;
- what property and infrastructure were damaged;
- other agencies involved;
- a record of the fire danger index on the day;
- fire response activity undertaken.

This information assists insurance claims for property damage resulting from a fire incident, and also assists FRS to assess their response strategies.

The City of Gosnells should, as a matter of process, request a copy of the FIRS for its record keeping and management improvement.

In addition to data obtained from the FIRS, the City of Gosnells should maintain a record of fire damage to the natural environment. This should include mapping the extent of fire damage, and the vegetation communities affected. Photographic records should also be maintained. Other information should be recorded opportunistically, including notable loss of fauna and fauna habitat.

Action 13 (5.3.2): Additional to information from the FIRS, the City of Gosnells should maintain a record of damage to the natural environment including but not limited to accurate mapping of fire extent, vegetation communities affected and other opportunistic observations such as notable loss of fauna and habitat.

5.3.3 Post Fire Access Management

The safety of publicly accessible areas and facilities may be compromised as a result of fire within the Reserve. Uncontrolled public access to burnt areas may also compromise natural recovery processes.

The City will assess, as soon as possible following a fire, safety of publicly accessible areas and facilities, such as the paths, tracks and other infrastructure such as playground and rotundas, and make provision to make safe and/or manage public access.

Public access to burnt natural areas will be restricted, if necessary, via temporary fencing and signage. Where appropriate, signage will be installed to inform of ecological impacts of fire and unmanaged access.

Action 14 (5.3.3): The City of Gosnells to evaluate, as soon as possible following a fire, the condition of publicly accessible areas and infrastructure and take appropriate action to make safe and/or manage public access. Access to burnt natural areas will also be evaluated, and managed as required by temporary fencing and/or informative signage.

5.3.4 Ecological recovery

The post fire environment presents management needs and opportunities for natural areas of the Reserve.

Due to the unanticipated nature and extent of fire, it is important that the City has capacity for sufficient resource flexibility to manage the site appropriately post-fire. Un-programmed intervention, including the management of weed regrowth, access and rehabilitation will most likely exceed financial resources budgeted for SRRW. Prompt intervention may, however, be critical to minimising ecological degradation and higher future management costs.

Post-fire monitoring and management is critical in protecting the Reserve's ecological values. A broad regeneration methodology is required to inform management. Natural recruitment and weed growth needs to be assessed and managed in the context of the severity of the fire. This broad regeneration methodology should be refined and, to this end, the City should establish liaison with relevant tertiary education institutions to seek partnership in the post-fire management of the Reserve. Post-graduate studies in fire ecology, for example, should be offered research opportunities in the Reserve post-fire.

5.3.4.1 Natural Regeneration

A moderately hot fire has the potential to result in natural regeneration from seed, lignotuber and epicormic sources. In this instance targeted weed control will be the primary intervention for natural regeneration required. Long-term weed control should be informed by monitoring and assessing the success of natural recruitment. Subject to resources, this may include (in order of least to highest cost) observation, photo-point monitoring, quadrats, vegetation condition mapping and/or weed mapping.

5.3.4.2 Assisted Regeneration

Disturbance arising from fire is known to promote the growth and spread of environmental weeds (EPA 2004). An iterative approach is required to "assisted regeneration", whereby the planting of appropriate species, and targeted weed control may be required. Long-term weed control should be informed by monitoring. Assessing the success of natural recruitment, as described above, will inform the requirement for assisted regeneration through direct seeding and/or tube-stock planting.

Of critical importance is the need for any Assisted Regeneration stock to be of local provenance. Should such need arise, seed and/or cutting material should be sourced from unburnt portions of the Reserve, or from neighbouring wetland vegetation located on Warton Road within Bush Forever Site 125.

In the context of Natural Regeneration and Assisted Regeneration other aspects of this management plan need to be taken into consideration including the restriction of public access via signage and temporary fencing and signage as outlined in **Action 14**.

Action 15 (5.3.4): The City to undertake visual monitoring of regenerating burnt areas of the Reserve, and to establish and maintain photographic and text records to assist in the management of regeneration and weed growth; resources should be allocated to monitoring quadrats, vegetation condition mapping and/or weed mapping as required with regard to the management of poor natural regrowth and excessive weed growth following an intense fire.

Action 16 (5.3.4): The City to establish liaison with an appropriate tertiary education institution and/or appropriate external agency to establish a partnership in the post-fire management of the Reserve.

Action 17 (5.3.4.1): The City to engage a suitably qualified and experienced environmental weed management contractor to undertake weed control in regenerating areas of the Reserve post-fire; weed management to target priority fire-responsive weeds such as Veldt grass.

Action 18 (5.3.4.2): Where "assisted regeneration" is dictated, the City to ensure that all introduced vegetation material is of local provenance.

Fire Management Plan Actions

The table uses the following prioritisation of actions: **H** = High Priority/undertake in short-term, **M**= Medium priority, **L**= low priority (or long-term action).

Fire management

Action	Responsibility	Priority	Programming	Outcome
Change in wetland hydrology **Action 1** (5.1.2.1): City of Gosnells to regularly monitor the health of vegetation in the area affected by changed hydrology for plant deaths and increased fire hazard from standing biomass	Environmental Coordinator	H	Establish photo monitoring points and monitor in November and April (ongoing)	Record of change to vegetation; identification of possibly increased fire hazard.
Change in wetland hydrology **Action 2** (5.1.2.1): The City of Gosnells to regularly monitor areas on the south-western side of the Reserve, adjacent to and impacted by seepage from artificial waterbodies, for weed incursion, and to take appropriate management action, which should include weed control, but not exclude revegetation/ rehabilitation with appropriate species.	Principal Coordinator Environmental Operations	H	Establish photo monitoring points and monitor Quarterly. Take appropriate action as required.	Help reduce the production of preventable fuel load and a reduction in ignition risk through decreasing dead biomass generated through excessive weed growth.

Action	Responsibility	Priority	Programming	Outcome
Change in wetland hydrology **Action 3** (5.1.2.1): The City of Gosnells to seek to determine the cause of seepage from artificial waterbodies on the south-western side of the Reserve, with a view to quantifying its impact on native vegetation, and to develop a means of remediating the problem, should it be determined to have a measurable negative impact on the vegetation.	Manager Technical Services	M		Seek to arrest seepage through bunded walls from leaking artificial water bodies. As a consequence will help reduce the production of preventable fuel load through vegetation decline and weed growth.
Weed Management **Action 4** (5.1.2.2): The City of Gosnells to maintain weed control work as guided by Shreeve Road Reserve Wetland Management Plan (2006) and Shreeve Road Reserve Wetland Fire Management Plan focusing, as required, on the reduction of high fire ignition risk sources through the physical removal of standing dead biomass of species such as Pampas Grass and *Acacia longifolia*.	Principal Coordinator Environmental Operations	H	Ongoing – as directed by SRRW Management Plan. Detailed programme to be developed and implemented by 1 July 2009	Assist in reducing the fuel load of the area and reduce ignition risk. Removal of species such as *Acacia longifolia* which are identified as potentially being post fire dominant will reduce the maintenance burden in a post fire environment.
Weed Management **Action 5** (5.1.2.2): City of Gosnells undertake weed and vegetation condition mapping for the Reserve and ensure that it is maintained to provide current weed and vegetation condition information.	Environmental Coordinator	M	Ensure resources provided as early as possible to undertake required work	Comprehensive weed and condition mapping will precisely guide weed management within the Reserve currently and guide weed management post fire. Condition mapping will provide baseline information for assessing regeneration progress post fire.

Action	Responsibility	Priority	Programming	Outcome
Action 6 (5.1.3): The City of Gosnells to ensure that prescribed burning is not undertaken as a means of managing fuel loads in the Reserve.	Environmental Coordinator and Risk & Emergency Management Coordinator	Ongoing	Ongoing	Prescribed burning is not recommended due to the vegetation structure and limited access within the densely vegetated dampland. The likelihood of an ensuing peat fire, which is very difficult to extinguish, also supports this decision.
Unauthorised activities **Action 7** (5.1.4): The City of Gosnells to maintain its regular Reserve inspection regime, particularly into less accessible portions of the Reserve, and remove all materials associated with the construction of 'cubby' areas within the Reserve.	Principal Coordinator Environmental Operations	H	Quarterly	Discourage unauthorised activities within the Reserve and remove fuel and ignition sources within the Reserve.
Fire Access **Action 8** (5.1.5.1): The City of Gosnells liaise with DEC and, in liaison with FRS and the Gosnells Bushfire Brigade, examine post-fire opportunities for the management of regrowth vegetation to provide for a safe emergency access track, which may also provide a coincidental managed pedestrian access to the Reserve's interior.	Environmental Coordinator	H	Post fire – inspect burnt area, identify opportunities. Liaise with FRS, Gosnells Volunteer Bushfire Brigade and DEC if opportunity identified	Provide opportunity to improve access for ground-based fire suppression. This will also improve opportunities for managing and containing unplanned fire within a discrete section of the Reserve which will reduce potential impact on the Reserve's biodiversity. (This may coincide with outcome of Action 9)

Action	Responsibility	Priority	Programming	Outcome
Pedestrian Access **Action 9** (5.1.5.2): The City of Gosnells to explore opportunities for providing managed access to the wetland proper to improve passive surveillance, and to seek clarification from the Department of Environment and Conservation on the application of *Environmental Protection (Clearing of Native Vegetation) Amendment Regulations 2007* in this regard.	Environmental Coordinator	M	September 2009	Appropriate and well designed pedestrian access will improve passive surveillance and aid to further public and community awareness and ownership of the area.
Arson **Action 10** (5.1.6): The City of Gosnells, in liaison with FESA, to develop and implement a strategy for the dissemination to the adjoining residential community and nearby schools of information on the Reserve, the risks presented by fire, and the role they can play in fire prevention and reporting.	Environmental Coordinator	H	Initiate April 2009 - Completion November 2009	Local community of Shreeve Road Reserve Wetland to receive information on the role they play in fire management. The strategy will aim to: • Increase the community's understanding of the role they play in fire prevention within the Reserve including improving awareness of arson • Create an understanding (particularly with children) of the consequences associated of fires • Increase community awareness of fire prevention and risk reduction strategies for private property • Raise community awareness of the City's active management of the Reserve

Fire Suppression

Action	Responsibility	Priority	Programming	Outcome
Fire Response Plan **Action 11** (5.1.8): The City of Gosnells to maintain ongoing liaison with FRS regarding the continual improvement of the Fire Response Plan for the Shreeve Road Reserve Wetland, and similar plans for other natural areas of ecological importance.	Environmental Coordinator and Risk & Emergency Management Coordinator	M	Ongoing - update as new fire Response Management issues arise	All agencies involved in fire suppression within the Reserve to have an understanding of its ecological significance and the risk of potential environmental harm from uninformed fire suppression activities.

Post Fire Management

Action	Responsibility	Priority	Programming	Outcome
Debriefing **Action 12** (5.2.1): The City of Gosnells, through its involvement of the Gosnells Volunteer Bush Fire Brigade, actively encourage and participate in the conduct of a Post Incident Analysis involving all stakeholders.	Risk & Emergency Management Coordinator supported by City of Environmental Coordinator and Principal Coordinator Environmental Operations	H – Post Fire	Post fire (to be completed within 3 working days of incident)	Provides an opportunity for all parties to gain a fuller understanding of the dynamics of an event, and to review the implementation of the Fire Response Plan and this Management Plan.

Action	Responsibility	Priority	Programming	Outcome
Record keeping **Action 13** (5.2.2): Additional to information from the FIRS, the City of Gosnells should maintain a record of damage to the natural environment including but not limited to accurate mapping of fire extent, vegetation communities affected and other opportunistic observations such as notable loss of fauna and habitat.	Principal Coordinator Environmental Operations and Environmental Coordinator	H – Post Fire	Post fire (to be completed within two weeks of incident). GPS mapping to provide information for uploading on City's GIS	Forms part of the historical information for the Reserve and will feed directly into developing management actions for the Reserve post fire. Form to be completed within a week of the fire.
Access control **Action 14** (5.3.3): The City of Gosnells to evaluate, as soon as possible following a fire, the condition of publicly accessible infrastructure and take appropriate action to make safe and/or manage public access. Access to burnt natural areas will also be evaluated, and managed as required by temporary fencing and/or informative signage.	Principal Coordinator Environmental Operations	H – Post Fire	As soon as possible post fire	Excluding general public from disturbed areas.
Ecological recovery and monitoring **Action 15** (5.3.4): The City to undertake visual monitoring of regenerating burnt areas of the Reserve, and to establish and maintain photographic and text records to assist in the management of regeneration and weed growth; resources should be allocated to monitoring quadrats, vegetation condition mapping and/or weed mapping as required with regard to the management of poor natural regrowth and excessive weed growth following an intense fire.	Environmental Coordinator	H – Post Fire	To be initiated within one month post fire. Establish photo monitoring points, undertake photo monitoring bimonthly for first 12 months. Further monitoring requirement to be evaluated.	• Contribute to informed post fire management action. • Early identification of management issues

Action	Responsibility	Priority	Programming	Outcome
Action 16 (5.3.4): The City to establish liaison with an appropriate tertiary education institution and/or appropriate external agency to establish a partnership in the post-fire management of the Reserve.	Environmental Coordinator	M	Forward enquiries to appropriate tertiary education institution and/or appropriate external agency to establish opportunity and establish agreement in principle and procedure for action post fire.	• This will ensure the development of efficient, standardised and appropriate monitoring methodologies and regeneration technologies are incorporated into the post fire management of the area. • Develop post fire vegetation condition and weed monitoring methodology. This will inform post fire revegetation works, in particular will identify priority management strategies and actions to be implemented post fire. • Establishment of monitoring techniques • Establishment of general post fire management objectives
Ecological recovery and monitoring **Action 17** (5.3.4.1): The City to engage a suitably qualified and experienced environmental weed management contractor to undertake weed control in regenerating areas of the Reserve post fire; weed management to target priority fire-responsive weeds such as Veldt grass.	Principal Coordinator Environmental Operations	H – Post Fire	As required	Informed, targeted weed control will ensure potential weed problems resulting from fire are mitigated and potentially improve condition of some areas. In particular, this will limit off target damage of regenerating areas and assist in targeting particular weed species
Action 18 (5.3.4.2): Where “assisted regeneration” is dictated, the City to ensure that all introduced vegetation material is of local provenance	Principal Coordinator Environmental Operations	H	As required	Maintenance of local gene pool

An evaluation of the feasibility of installing fire access track across the Reserve and recommendations.

Appendix 1: Amended Shreeve Road Reserve Wetland Fire Response Plan (March 2007) – recommended revisions

Item	Description			
Hazard Management Agency	FESA – Fire and Rescue Service			
Incident Control Point Locations (Gosnells BFB)	Level 1	Fire Officer Discretion		
	Level 2	Canine Association, corner Warton Rd and Ranford Rd		
	Level 3	Gosnells BFB/ SES Station, Canning Park Rd, Maddington		
Mobilisation	Fire Danger Rating	1st Dec to 31st March	All Ratings	Canning Vale CFRS, Canning Vale 24 CFRS, Maddington CFRS, Gosnells BFB, Water Bombers, Helitacs and Air Intelligence (standby and when available), ICV (standby), FESA DM notified
		1st April to 30th Nov	Extreme Very High High	
			Moderate Low	Canning Vale CFRS
Description	General	Within a Gazetted Fire District and is characterised by medium to heavy scrub and sedgelands bordered on all sides by residential housing.		
	Terrain	Some areas are wet all year round and can be boggy		
	Fuels	Predominately Paperbark with some gumtrees and sedgelands		
Special Risks	Environmentally Sensitive Area **Consultation with DEC required**	Environmental Protection	Wetland is rated Conservation Management category (DEC). Entire area is environmentally sensitive, containing unique flora and fauna, which may be destroyed by vehicle use. Site known to have P3 species *Stylidium longitubum,* P4 species *Anthotium junciforme* and P5 species *Isoodon obesulus fusciventer*. Area is also susceptible to drainage degradation resulting from un-natural water drainage which can be caused by use of machinery providing inadequate fire breaking.	
	School	Occupants during school hrs	Excelsior Primary School, Shreeve Road	
	Housing	Residential housing		
Warnings	Roads	Minor roads carry local traffic and road closures should be considered. Traffic plan required to direct cars away from Reserve in times of fire threat		
	Visitor Information Display	Waterperry Drive		
Access	Boundary Roads	Northern Access – Shreeve Road South, East and West Access – Waterperry Drive		
	Internal Roads	No strategic tracks available for 4WDs. Firebreak along western perimeter inundated for majority of year so is of limited access value.		
	Gates	3 potentially locked gates along perimeter – northern end of firebreak along Shreeve Rd, two along limestone path in southern corner off Waterperry Dr. Use City of Gosnells G&M (Grounds and Maintenance) key for entry.		
	Key Holders	City of Gosnells – FIRS, Gosnells BFB, FESA DM PSE, FESA CFM PSE		
Communications	Radio	ComCen	FRS	55
			BFB	25
		Command	FRS	38
			DEC	17
		Sector	96, 97, 98, 99, 28 TA (Talk Around)	
		Backup Command	FESA	SES Communications Support Unit 31
			DEC	09
	Mobile Phone	Generally Good handheld and vehicle mounted phone coverage		

Item	Description	
Water Points	Hydrants	Refer to Figure 5 in this report
	Tanks	None
	Lakes	Bletchley Park Estate, 2.5km south of Reserve for helitacs
Air Support	Helipad Locations	Canine Association, corner Warton Rd and Ranford Rd
	Foam Usage	Foam is **NOT** to be used unless in last resort
Refuges and Safe Havens	Within Reserve	None
Critical Infrastructure	None	
Fuel (24 Hours)	Petrol/ Diesel	Caltex Service Station, Corner Kelvin and Orchard Roads

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