

CITY OF



MITCHAM

# BELAIR RESERVE

(southern section)

## MAINTENANCE PLAN

**DRAFT**

July 2003



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City of Mitcham

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# 1. RESERVE IDENTIFICATION

<b>Reserve Name :</b>	Belair Reserve (R616)– southern section. This maintenance plan excludes the northern sections of Belair Reserve – former Lynton Council Depot and Lynton Landfill. Separate maintenance plans will be developed for each in the future due to different land-uses and management issues.
<b>LGA :</b>	Mitcham
<b>Location :</b>	The reserve is located within Belair and Lynton and is bounded by the following: <ul style="list-style-type: none"><li>• Northern boundary - rehabilitated Lynton landfill;</li><li>• Northern-eastern boundary - Kalyra Road, Caroline Avenue and High Street;</li><li>• Southern boundary -Mead Street and portion of Lind Avenue;</li><li>• Western boundary - railway line;</li><li>• Western boundary - bushland, part of Lot 2 (Lynton landfill).</li></ul>
<b>Title Information:</b>	Section 702 Certificates of Title <ul style="list-style-type: none"><li>• C/T 5764/699, DP 105100, 0.17 ha</li></ul> Section 1147 Certificates of Title <ul style="list-style-type: none"><li>• Lot 39, C/T 3766/08, DP 9401, 2.94 ha</li><li>• Lot 40, C/T 5860/468 (formerly CT 4207/613), DP 17195, 7.9 ha</li></ul> Section 1148 Certificate of Title <ul style="list-style-type: none"><li>• Lot 1, C/T 5518/779, (formerly CT 4115/547), DP 9378, 2.3 ha</li></ul> Section 1073, Certificate of Title <ul style="list-style-type: none"><li>• Lot 19, C/T 5772/172 (formerly CT 4115/546), DP 149652, 19.83 ha. Confirmed on State Heritage Register 8/8/96</li></ul> Refer to Appendix A for certificates of titles
<b>Zoning :</b>	Hills Face Zone (HFZ)
<b>Size :</b>	Approximately 33 hectares
<b>Class of Reserve:</b>	Undeveloped – modified woodland (a) semi-natural

## 2. BACKGROUND, HISTORY & STATUS OF THE RESERVE

### 2.1 BACKGROUND AND STATUS

Currently Belair Reserve (R616) consists of approximately sixty-nine hectares which includes Council's former operations depot and landfill. Due to the significant differences in past land-use and management requirements within Belair Reserve, a separate maintenance plan will be developed for the:

- Rehabilitated Lynton landfill
- Former Council operations depot
- Southern section of Belair Reserve

This maintenance plan addresses the southern section of Belair Reserve which contains part of the Sleeps Hill Quarries complex (east of the railway line). It is recommended to rename this reserve in order to avoid confusion amongst the community and staff with the nearby Sleeps Hill Reserve (west of the railway line). For the purpose of this maintenance, the reserve will be referred to as "*Belair Reserve (southern section)*." However, Ragless pers. comm., (2002) recommends the following name changes:

- Belair Reserve (southern section) - change to "*Sleeps Hill Quarry Reserve*." This is appropriate as this section contains the Sleeps Hill Quarry Trail. The remaining parts of Belair Reserve (depot and landfill) should also be renamed at a later date to avoid confusion with the nearby Belair National Park.
- Existing Sleeps Hill Reserve (situated west of the railway line, south of Seaview Crescent) - change to *O'Dea Reserve* (pronounced O'Dear) or *O'Dea's Quarry Reserve* as the quarries within this reserve were opened in 1846 by John O'Dea. The reserve's current name causes confusion with the nearby Belair Reserve (east of the railway line) which is commonly referred to as Sleeps Hill Reserve because of the quarry complex and trail within its boundaries.

The southern section of Belair Reserve (R616) is amongst the largest of City of Mitcham's undeveloped woodland reserves with an area of approximately thirty-three hectares. It is situated approximately 1.5 kilometres south-west of the Belair Country Fire Service station. The reserve is irregular in shape with residential development on its north-eastern, eastern and southern boundaries. The majority of its northern boundary is adjacent to the former Lynton landfill. The Trans Adelaide railway forms the reserve's western boundary.

Belair Reserve (southern section) is part of a larger network of undeveloped woodland reserves across the Mitcham Hills such as Ashby Reserve, Watiparinga National Trust Reserve, Sleeps Hill Reserve (west of railway line), Windy Point, Randell Park and Shepherds Hill Recreation Park.



Watiparinga and Ashby Reserve are in close proximity to Belair Reserve (southern section) and share many similarities such as vegetation associations. Consequently, their management and maintenance plans have been utilised as a valuable source of information for the compilation of this maintenance plan and have been acknowledged accordingly.

The *City of Mitcham Open Space Survey 1982* (Moyle et al 1982) classified the entire Belair Reserve (R616) as "Undeveloped: modified woodland – (a) semi-natural, designated rubbish dump." Definitions of the classification from chapter four of the report state:

- "Undeveloped Reserves" – those reserves which remain in a largely semi natural or cleared condition without any specific development for a particular function.
- "Modified woodland" – all areas of wooded land. The group is further subdivided into: (a) Semi-Natural Woodland: woodland in a largely natural condition; some with exotic shrubs in the understorey, and (b) Woodland Dominated by Exotic Plants: most of the natural vegetation has been crowded out by exotics.

The above classifications assigned to the reserve in 1982 remain accurate. As previously stated, this maintenance plan does not include the entire Belair Reserve in particular those titles forming the former landfill and Council operations depot.

## STRATEGY

2.1 Rename Belair Reserve (southern section) to "Sleeps Hill Quarry Reserve" and the existing Sleeps Hill Reserve to "O'Dea Reserve" or "O'Dea's Quarry Reserve" - *pronounced O'Dear('s)*. The remaining sections of Belair Reserve (depot and landfill) can be renamed at a later stage.

## 2.2 EUROPEAN HISTORY

A concise history of Belair Reserve (southern section) has been compiled with the assistance of Maggy Ragless, City of Mitcham's Historian from Land Titles and Old Systems searches.

During the mid 1800s, land in the southern section of Belair Reserve was held by absentee landholders and rented out to small scale farmers. Later, land was leased or purchased for quarrying which commenced during the late 1800s (Ragless, M., pers. comm., 2002).

The reserve is known locally as "Sleeps Hill Quarry Reserve" and contains the "Sleeps Hill Quarries Interpretive Trail." This causes confusion as a nearby Council Reserve (R424) situated west of the railway line has been renamed "Sleeps Hill Reserve," with Belair Reserve being its former name. According to Ragless (pers. comm., 2002 citing Oborn et al (1981) and Cockburn (1970s), the name "Sleeps Hill" is derived from Samuel Sleep who was employed as a shepherd by the South Australian Company. Samuel later became a pastoralist in the far north of South Australia but went broke due to a succession of bad years. He died in 1864 during the Great Drought.

According to an interpretive sign above Quarry E by the Department of Mines and Energy, quarries were opened in the reserve by A. H. Birt in 1916 and taken over by Adelaide Quarries Ltd in 1919. During the 1920s these quarries were one of the leading producers of crushed rock in South Australia and employed up to 100 men. The rock was used as aggregate and

sand for a variety of purposes. After 1930 following the Depression, quarry operations were seriously curtailed and only a few men were employed. Quarrying ceased around 1950.

An undated map of Belair Reserve has noted the transfer of land from previous owners to the City of Mitcham and are listed below.

Lot 1	: Transferred from Residential Developers Pty Ltd, 13 September 1970
Lot 19 and S. 702	: Transferred from Residential Developers Pty Ltd, 23 October 1970
Lot 39	: Land vested in the City of Mitcham from Residential Developers Pty Ltd, 13 September 1971
Lot 40	: Transferred from Residential Developers Pty Ltd, 7 June 1971

Elders Lensworth Finance Ltd, transferred allotment 36 High Street, Lynton to the City of Mitcham to merge with the adjacent reserve. This allotment was originally set aside for the E&WS Department, who later did not require the 9 x 13 metre site.

Over the years the section of reserve adjacent to the old crushing plant has been the focus of a community environmental weed control and revegetation project by the "Sleeps Hill Scrub Landcare Project" and Clapham Primary School. In 1993 the primary school planted 170 indigenous trees and shrubs north-east of the Sleeps Hill tunnel. The Landcare group has received a number of awards to recognise their achievements. In 1996 Trees For Life requested the establishment of three Bushcare sites in the Sleeps Hill Quarry complex, which were approved and funded by the City of Mitcham.

A discussion paper titled *"The Proposed Rehabilitation of Mitcham Hills Quarries"* by City of Mitcham Councillor, Bob Marshall, was released in June 1995. The paper discussed filling the disused quarries with inert waste and clean fill, then later revegetating the capped surface with native vegetation. The primary objectives were to:

- Screen the exposed quarry faces along the Hills Face Zone;
- Extend the life of existing landfills in Adelaide;
- Receive revenue from tipping fees to fund revegetation works in the reserve;
- Community participation and consultation in revegetation of capped landfills; and
- Reduce hazards to bushwalkers posed by steep quarry faces.

The discussion paper received strong objection from a number of residents arguing the heritage value of the quarries, geological education opportunities and impacts on native vegetation from using the quarries as a landfill. However, the paper was successful in raising the profile of Mitcham's quarries and providing a catalyst for formulating management actions such as safety issues and vegetation surveys for conservation purposes.

Soon after Councillor Marshall's discussion paper, Mr Royce L. Wells released a report titled *"Mitcham Quarries: The Definitive Analysis for Total Preservation."* In July 1995. The report provided a comprehensive list of quarries within the City of Mitcham, their history, geological significance and argued against using the quarries for landfills. Mr Wells opposed the argument that disused quarries were a scar on the landscape. He argued that they:

- Are a valuable educational resource;
- Display significant geological formations;
- Are already screened in many instances by regenerating native plants;
- Are aesthetically pleasing - natural beauty of rock faces

In regards to the Sleeps Hill Quarries, he comments on the unique faces of the complex, walking trail and the great 100 foot face of Quarry 'D' as... "*one of the most exiting natural rock faces anyone could wish to see in the Adelaide Hills.*"

Council later resolved that before any development of the quarries can be considered, a safety audit was required for each quarry including identifying boundaries, vegetation and history. A sum of \$15,000 was approved. Subsequently, in 1996 Council received the "*Report on Quarries for City of Mitcham*" - prepared by Gupta Environmental and Planning Consultants and A&M Drilling and Blasting Services.

A heritage survey by Taylor Weidenhofer (1995) was commissioned by the City of Mitcham, in association with the State Heritage Branch of the Department of Environment and Natural Resources. This report was part of a wider heritage survey within the City of Mitcham. The report stated its heritage value as significant as they:

*.. illustrated a typical pre war quarry. Small scale quarries such as Sleeps Hill (and there were many in this area) have become no longer viable because of changed methods of operation and changing attitudes to worker safety. Sleeps Hill is important because it is intact and clearly displays the technologies and methods used to quarry and process the rock. There are few unfilled or intact quarries remaining from this period that are accessible.*

The State Heritage Authority provisionally entered the Sleeps Hill Quarries on its Register on 11 April 1996 and in correspondence to Council on 6 May 1996, sought comment on this entry. A letter from the State Heritage Authority to Council on the 8 August 1996 (Appendix B), confirms the entry of the Sleeps Hill Quarries on the Register in recognition of its value to the heritage of South Australia. Relevant criteria being:

*(d) is an outstanding representative of a particular class of places of cultural significance in illustrating an in-tact pre-Second World War quarry that reveals quarrying methods and technologies.*

As the Sleeps Hill Quarries have been entered on the Register, any proposed developments must be referred to the planning authority for approval under the Development Act 1993 (Towle, 1996)

Council files reveal a resident's concern over Trans Adelaide transit police (1996) prohibiting residents from crossing the railway line at Gamma Crescent, Panorama into Belair Reserve. This was undertaken to minimise the risk to residents as the railway line is a busy transport route. An alternative route is to access the quarries via Hillrise Road.

In 1998 a working party was formed to investigate and report on safety issues in the Mitcham quarries. The working party comprised of members from the Local Government Mutual Liability Scheme, Department of Mines and Energy SA, Mitcham Open Space Advisory Committee (MOSAC) and a City of Mitcham Councillor and three officers. Eighteen months later the working party released "The City of Mitcham Quarries 1999" report. Various recommendations were made to upgrade fencing and signage in specific areas.

A contractor (ADCIV) in 1999 completed pipe laying through an easement for the sewer relay at Kalyra Road. Currently the reserve is largely managed through a number of Bush For Life (formerly Bushcare) sites and City of Mitcham operations.

## Application 25797 and other sources

### Sections 1073 and 1074 Hundred of Adelaide

3 <sup>rd</sup> Oct 1846	Section 1074. For L80.06.0 of 80 acres. Land grant to Hiram Manfull of Chellaston Grove Farm, farmer
27 <sup>th</sup> Oct 1846	Section 1073. Land grant to John O'Dea labourer of Adelaide for L78 of 78 acres.
7 <sup>th</sup> April 1853	Section 1074. Power of Attorney – H. Manfull, gentleman “about to leave the province and I have requested William Bartley and William Bakewell of Adelaide, solicitors and co-partners to take upon themselves to care of my estate and property in SA.”
10 <sup>th</sup> Oct 1853	Conveyance of Sections 1074 and 1080 from William Bartley and others to George Morphett for L415.16.00
6 <sup>th</sup> Dec 1856	Sections 1074 and 1080. Contract for sale from G. Morphett to T. H. Ayliffe.
23 <sup>rd</sup> July 1859	Sections 1074 and 1080. Agreement of sale to John O'Dea some six months before the term contracted for Ayliffe's completion.
16 <sup>th</sup> Sept 1864	Sections 1074 80 acres & Section 1080 5 acres. Indenture from George Morphett later of Adelaide now of Windsor, county Berks, England gentleman to John O'Dea, of Spring Gully, farmer. For L297 “together with all buildings, fences, timbers, ways and rights.
18 <sup>th</sup> June 1868	Section 1073. CT 115/240. Henry Hobhouse Turton gentleman of Adelaide part Section 1073 of lac 2 rds and 4 perches.
15 <sup>th</sup> Oct 1875	Section 1073. Trans 592 85 from HHT to Patrick Callaghan of Adelaide. CT CCXIV/167 (Lands Department Old Systems and Lands Title Office).
21 <sup>st</sup> June 1878	Sections 1073, 1074 and 1080 (82 acres). Conveyance from John O'Dea of Humphreys Springs farmer and Daniel O'Dea (son of John of Springbank stockdealer “in consideration of the natural love and affection which the said John O'Dea hath and beareth towards the said son, Daniel O'Dea...for 5/-“
19 <sup>th</sup> Jan 1882	Sections 1073, 1074 and 1080 (82 acres). Mortgage from Daniel O'Dea to Hon Sir William Milne off Sunnyside near Adelaide and Samual Tomkinson for L2500.
25 <sup>th</sup> Jan 1886	Sections 1073, 1074 and 1080 (82 acres). Mortgage between Henry Palmerston Tomkinson, Hon Sir William Milne of Sunnyside and Hon. Samual Tomkinson member of Leg. Council for 2500 for 82 acres of Section 1080; 78 acres of Section 1073; 2 acres of Section 1073 to John O'Dea to Henry Hobhouse Turton and also except for Part Sections 1073 and

- 1074 and 1080 16 acres 1 rood Y 17 perches from Dan O'Dea to Honourable James Garden Ramsay. CT 1029/162 and 163.
- 25<sup>th</sup> Jan 1886 Sections 1073, 1074 and 1080 (82 acres).  
Conveyance from Sir William Milne and Samuel Tomkinson to H. P. Tomkinson for L2500
- 25<sup>th</sup> mar 1887 Sections 1073, 1074 and 1080 (82 acres).  
Conveyance from H. P. Tomkinson Solicitor to John Charles Marshall Taylor of Purbrook near Dorking, county of Surrey, England, gentleman.
- 1888 Section 1073. License to quarry stone expired
- 1901 Sections 1073 and 1080 no occupier Taylor's Estate owner 4 acres Quarry L50  
Mattingly, E. occupier Taylor's Estate owner 4 acres, Quarry L100
- 1910 Real Property Act
- 10<sup>th</sup> Mar 1915 Sections 1073, 1074 and 1080 (82 acres).  
Letter Occupancy of these lands by Richard Mitchell
- 5<sup>th</sup> June 1915 Sections 1073, 1074 and 1080 (82 acres). CT 1029/162 ex App 25797  
SAR Part section 1073 of 2 acres, 3 roods and 29 perches.  
  
Sections 1073, 1074 and 1080 (82 acres). CT 1029/163 ex App 25797  
John Charles Marshall Taylor gentleman of 23 Cork Street London, Middlesex, England. Part Section 1073 of 68 acres 2 roods. A Part Section 1074, 72 acres, 1 rood; and Part Section 1080 of 45 acres and 3 roods.
- 3<sup>rd</sup> Aug 1916 Sections 1073, 1074 and 1080 (82 acres). CT 1029/163 ex App 25797  
Trans 661850 from JCMT to the SA Railways. New CT 1060/137, 138.
- 18<sup>th</sup> April 1950 Sections 1073, 1074 and 1080 (82 acres). CT 2074/103 ex CT 1446/91  
Kevin Sygieh Rasheed and his wife Joyce Frances Rasheed of 277 Goodwood Road, Springbank Refuelling Officer.
- 25<sup>th</sup> May 1948 Sections 1073, 1074 and 1080 (82 acres). CT 2074/103 ex CT 1446/91  
Mortgage 1527790 from KSR & JFR to Director of War Service Homes. Discharged 17<sup>th</sup> September 1951. Continually mortgaged to 1980.
- 29<sup>th</sup> Oct 1971 Sections 1073, 1074 and 1080 (82 acres). CT 1029/162 ex App 25797  
Trans 235441 to the City of Mitcham CT 4028/233

### **Section 1147 Hundred of Adelaide**

- 1891 Mrs Thomas occupier, A. Hall occupier building 100
- 1901 J. J. Thomas, 94 acres land outside town L18. Owner A. Hall  
D & M O'Neil Quarry owner A. Hall

## 2.3 ABORIGINAL HISTORY

According to Robertson (1999 p61) the area lies within the country of the Kurna, the Adelaide Plains people. The stringy bark forests of the Mount Lofty Ranges marked their eastern boundary. The Kurna were seasonally nomadic people tending to travel along coastal areas in summer and moving to the more timbered foothills in winter, where there was more shelter and firewood. Uses of indigenous plants found in the region by Aboriginals is provided in Appendix C.

## 2.4 CLEARANCE HISTORY

Copice re-growth of grey box (*Eucalyptus microcarpa*) dominates the vegetation throughout the reserve. Timber was probably cleared for fuel, building materials and quarry operations. Quarrying has been responsible for crater-like depressions across the reserve where native vegetation once existed.

A number of large stumps and tree hollows with a diameter of approximately 1.5 metres provide evidence that substantial eucalypts once colonised the reserve. Unfortunately these have been felled.

## 2.5 FIRE HISTORY

A snapshot of the fire history of Belair Reserve (southern section) has been sourced from Thomson (pers., comm, 2002) and a review of the City of Mitcham's District Bushfire Plans that were available from the past ten years. Robertson (1999, pages 64-65) lists fires occurring in Watiparinga, which is in close proximity to Belair Reserve (south):

27 Dec 1961	Fire started in Centennial Park areas (Pasadena-Panorama) fanned by a strong north wind, completely burnt out Watiparinga National Trust Reserve on both sides of the railway line and threatened homes in the Eden Hills district - <i>The Advertiser</i> December 28, 1961 and National Trust records.
Summer 1972/73	Country Fire Service (CFS) records at Belair CFS station list many fires in the vicinity of Watiparinga when the area was considered a definite fire hazard. These records are given in acres: 1 acre = 0.405 hectares).
26 Mar 1973	Mead Street and Gloucester Avenue extension. Two-acre grass fire deliberately lit.
28 Aug 1994	Mead Street Belair. 1.5 hour grass-scrub fire, alerted at 2:00 AM
1 Jan 1999	Mead Street Belair. 43 minute fire

## 2.6 EASEMENTS

The following sewage easements are located within the reserve and are illustrated in Appendix A:

- Lot 1 Section 1148 CT 5518/779 Easement over the land marked B hereon to the Minister for Infrastructure (T 4141540)

Easement for sewerage purposes over the land marked A on DP 9378

- Lot 19 Section 1073 CT 5772/172 Easement over the land marked A and B to the Minister for Infrastructure (T 3841105 and 4141540 respectively)

It appears that this is a sewage easement running east-west along the gully from the rear of residential properties on Hawker Avenue. The smell of sewage was apparent near the crushing plant and wetland.

Confirmed in State Heritage Register 8/8/1996

- Lot 39 Section 1147 CT 3766/082 Triangular reserve at the end of High Street, adjacent to Lot 1. Source: subdivision plan of part section 1147, 1971.

Lot 36 was originally set aside for the E&WS but was surplus to their requirements and transferred to the City of Mitcham. Source: subdivision plan of part section 1147, 1971.

- Lot 40 Section 1147 CT 5860/468 Easement over the land marked A to the Minister for Infrastructure (T 4944102). Subject to a free and unrestricted right of way over the land marked B.

United Water (E&WS) sewage pump station adjacent to Kalyra Road. Source: file plan number 17195 for Plan of Land Division Hundred of Adelaide Part Section 1147, 12/10/82.

Water flowing from the tanks was observed which smelled like sewage.

Section 702 CT 5764/699 No easements on title

Utilities such as United Water should be made aware of this maintenance plan. Adverse impacts may result in the event of maintenance works or emergency repairs by staff indiscriminately dumping of materials, driving on the reserve or spreading nutrient rich waste

which appears to be occurring along the sewage easements. This maintenance plan should be communicated and embraced by all stakeholders so desired outcomes can be achieved.

## STRATEGY

2.6 (a) Communicate relevant sections of this management plan with United Water.

2.6 (b) When observed or notified, promptly report to United Water sewage overflow events on the reserve. Monitor occurrences and impacts of such events and take appropriate action as required.

## 2.7 LEGISLATION

Acts and associated regulations that may impact on the management of woodland reserves such as Belair Reserve (southern section) must be adhered to, and include (but not limited to) the:

- Local Government Act 1999
- Native Vegetation Act 1991
- Country Fires Act 1999
- Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)
- Environment Protection Act 1993
- Water Resources Act 1997
- Development Act 1993
- Metropolitan Drainage Act 1935
- Fences Act 1975
- Animal and Plant Control (Agricultural and Other Purposes) Act 1986



## **2.8 FENCING**

### **2.8.1 Boundary Fencing**

Fencing is generally poor along residential-reserve boundaries, particularly:

- South-west corner of Lot 19 where residential properties along Mead Street adjoin the reserve.
- Eastern edge of Lot 1 where the original post and wire fence has collapsed and is decaying, making it difficult to determine the reserve boundary.

The post and wire fence dividing Lot 40, Lot 39 and the north-western portion of Lot 19 from Lot 2 (Lynton landfill) is barely visible in most sections, having fallen and rotting with no apparent fence in the north-western portion of Lot 19. There is little use in erecting a fence along the edge of the landfill for the sake of marking a title, or in the north-western section of Lot 19 where Lot 2 and 19 are both bushland.

It would assist residents and Council staff when undertaking weed control and maintenance tasks to know precisely where reserve boundaries are located. This can be achieved by first having all boundaries (especially residential-reserve) surveyed followed by installing marker posts at 10-20 metre intervals, without the need for mesh or wire strands. However, fencing may be required to restrict access to areas of high habitat value.

There are arguments for and against fences. Adequately designed fencing can restrict the range of feral animals that prey upon native fauna. Fences can also restrict the movement of people entering the reserve from many points, creating new tracks and causing damage to native vegetation. Erecting fences can negate the benefits of habitat corridors, which link areas of remnant bushland.

#### **STRATEGY:**

2.8.1 (a) Install boundary markers along residential-reserve boundaries using posts (preferably recycled plastic) after they have been surveyed.

2.8.1 (b) Consider appropriate fencing around areas of high habitat value. Install entry and exit points along fences for movement of indigenous fauna.

## 2.8.2 Quarry Fencing

The scope of this maintenance plan does not include the inspection of quarry fencing. Extensive fencing was installed along sections of the quarry complex in the late 1980s, which was observed on-site.

### STRATEGY:

2.8.2 (a) Inspect quarry fencing for compliance to the Occupational, Health, Safety and Welfare Act (if not already done). Council should prepare a report on findings and recommended actions.

2.8.2 (b) City of Mitcham to maintain and repair existing quarry fencing where damage has occurred.

## 2.9 CURRENT MAINTENANCE OPERATIONS

Maintenance of the reserve is undertaken by the City of Mitcham and four Bush For Life sites (Appendix D). Maintenance undertaken by Council has included:

- 2003, removal of olives along the fire track in the northern section of the reserve under Council's Bushfire Prevention Program;
- 2002, Four hectares of boneseed control, below Caroline Avenue during September and October. This project was jointly funded through the Natural Heritage Trust's "Weeds of National Significance (WONS)" project and the City of Mitcham;
- 2001, Olive and boneseed removal below Caroline Avenue and Kalyra Road, part of Council's Bushfire Prevention Program;
- Past ten years, environmental weed control has occurred:
  - near the crushing plant ruins;
  - reserve between Quarry K and Mead Street;
  - gully north of Mead Street (west of Quarry A);
  - reserve between Quarry G and rear of houses on Hawker Avenue;
  - sections of the fire track (from High Street to Quarry J) to assist Bush For Life volunteers.
- Brush cutting and mowing exotic grasses for weed control and fuel breaks along accessible sections of the reserve adjacent residential properties.

In order to control environmental weeds and manage the indigenous vegetation in the reserve, Council will need to commit considerably more resources than it has previously. With this in mind, Council has recently established a "woodland reserve team" with the objective of undertaking minimal disturbance weed control in indigenous vegetation of high value. This is in addition to maintaining fencing and signs. In light of this, Council may still need to commit additional resources, as the woodland reserve crew's efforts will be stretched amongst some 500 hectares of Council's bushland and road reserves throughout the Mitcham Hills.

The Bush For Life volunteers continue to make an invaluable contribution to the reserve, not only by maintaining but also increasing biodiversity on each of the four sites (see Figure 2). Through minimal disturbance weed control, indigenous flora is regenerating in previously degraded bushland, dominated by weeds such as olives, boneseed and lavender. As Council lacks the resources to undertake similar works on the same scale as the volunteers, Council must continue to support the established Bush For Life sites and consider increasing the number of sites in the reserve. Establishing and maintaining Bush For Life sites is considered the optimum way in which to manage environmental weeds on a long-term basis. Benefits to Council include community participation in biodiversity management, capacity building, sustainable weed control, increasing biodiversity and cost-effective weed control.

**STRATEGY:**

2.9 (a) Review existing reserve and "woodland crew" budget to achieve strategies of this management plan.

2.9 (b) City of Mitcham to continue supporting existing Bush For Life sites.

2.9 (c) The City of Mitcham should increase the number of Bush For Life sites throughout the reserve.

## 3. RESERVE DESCRIPTION

### 3.1 PHYSICAL DESCRIPTION

#### 3.1.1 Topography / Land Form

From a topographic contour map (Figure 1) the reserve has a distinct “r” shape, the result of residential development in its south-east corner.

The reserve is dominated by steep north facing slopes with the exception of a steep south-west slope where Quarry E, H and J are situated and three gullies which carry stormwater from surrounding streets. Two gullies are almost identical in orientation, draining in a north-westerly direction and having slopes with a northern and south-western aspects. These gullies are situated at the rear of houses on Mead Street/Lind Avenue and Kalyra Road. The dominant gully of the reserve dissects Lot 19, providing a north and south facing slope which carries stormwater, spring water and sewage (piped) in a westerly direction.

Quartzite rock outcrops are common throughout the reserve especially on the steeper slopes. Intact indigenous flora can be found on the steep, north facing slopes which contain quartzite outcrops and poor soils. Likewise, Ashby Reserve also contains quartzite rock outcrops and poor soils on its steep sided slopes.

##### 3.1.1.1 Geology

The ‘Geological Map of the Adelaide Region’ by Thomson (1972) indicates that Belair Reserve is of the Late Pre-Cambrian Belair Sub-Group - part of the larger Burra Group. The Belair Sub-Group ‘have an age in excess of 750 million years’ (Drew, 1999, p 79).

According to Taylor et al.,(1974, p 13):

*The Belair Sub-Group...is characterised by sandstones and quartzites embedded with siltstones. The Sub-Group exceeds 300 metres in thickness and extends from the Glen Osmond area in a folded and faulted belt to the Blackwood area....The uppermost units display extensive ripple marks and mud cracks. The resistant members of the Sub-Group have been responsible for preserving part of the Tertiary weathering profile from erosional stripping after uplift. The relict weathering is expressed by the skeletal and podzolic soils of the Eden Hills-Belair-Coromandel Valley area occurring near the tilted old land surface preserved in places on the uplifted Eden Fault Block.*

According to Drew (1999, p79) the Belair Sub-Group was probably the result of deposition under shallow marine conditions. The finely laminated siltstones would represent low energy subtidal conditions. “The sediments were derived from the Gawler Craton to the west and entered the Adelaide Geosyncline...”

A summary of the geological history of the Adelaide region by Taylor et al., (1974, p 15) and specific details of nearby Watiparinga Reserve by Drew (1999, p 79) are listed below.

TABLE 1. GEOLOGICAL HISTORY OF THE ADELAIDE REGION

<i>Geological Time</i>		<i>Millions of Years</i>	<i>Event</i>
	Pleistocene	2-now	Change from arid to present climate, modern drainage regime fully established.  Continued uplift of fault blocks, erosion of calcrete and older sediments, blanket of Pooraka Formation as slope deposits extending to the Lower Outwash Plain. Uplift rejuvenated streams such as nearby Watiparinga Creek, draining from uplifted blocks.  Active block uplift of ranges area, high rainfall and rapid erosion of younger cover sediment deposition of riverine fans of Hindmarsh Clay in plains area; followed by arid interval, low sea level and formation of a calcrete mantle. End of tertiary, lacustrine sand and clays were deposited in the Belair-Blackwood area on the pre- or early-Tertiary peneplain.
	Pliocene	11-2	Marine sedimentation in plains area, lake deposits and laterite development in ranges area, followed by block uplift on revived para and Eden-Burnside Faults establishing framework for modern topography. Gentle faulting and erosion continues
	Miocene	25-11	Marine sedimentation in Adelaide Plains area, subsidence on fault blocks. Then gentle faulting and erosion in Miocene-Pliocene period.
	Oligocene	40-25	
	Eocene	60-40	
Cainozoic	Palaeocene	70-60	Prolonged erosion and peneplanation (erosion causing a flat landscape) in late Mesozoic and early Tertiary, deep watering, some lake and swamp deposits.
	Cretaceous	135-70	
	Jurassic	180-135	
Mesozoic	Triassic	225-180	
	Permian	270-225	Uplift of fold belt and glaciation of mountain range
	Carboniferous	350-270	
	Devonian	400-350	
	Silurian	430-400	
	Ordovician	500-430	Delamerian folding, faulting and metamorphism in the Lower Ordovician and development of fold belt on site of future Mount Lofty Ranges.
Palaeozoic	Cambrian	600-500	Development of Adelaidean and Lower Cambrian sedimentation in the Adelaide Geosyncline formed by downwarp of Pre-Cambrian crystalline basement, which includes the Barossa Complex in the ranges area.
Proterozoic	Pre-Cambrian	4,500-600	

### 3.1.1.2 Physiography

Belair Reserve (south section) is situated on the Eden Fault Block (Figure 3). According to Taylor et al., (1974). Late Cainozoic block faulting has shaped the current topography, drainage patterns and the Eden, Burnside and Para Faults. The Eden Fault forms the backdrop to Adelaide and its suburbs. It rises rapidly to 300 metres, or more above sea level in the central region, but falls slightly to the north and south.

Below the Eden and Burnside fault blocks are the upper outwash plains, which before European settlement formed from seasonal deposition of flood materials by creeks such as the Sturt River and Brownhill Creek (Taylor et al., 1974, p 16).

### 3.1.2 Soils

According to a study of the soils and geology of South Australia (Taylor et al., 1974, p 49) the Eden Fault Block is dominated by podzolic soils (mainly Type P2) and skeletal soils (SK) – Figure 4.

The study provides more information relevant to Belair Reserve (southern section):

*The surface of the Eden Fault Block of the Belair-Blackwood area shows a variety of land forms according to where smooth remnants of an old laterite (Tertiary) surface remain, or where there has been vigorous dissection and erosion to steep-sided narrow ridges. In the former case lateritic podzolic (Type P4), and in the latter other podzolic (Types P2, P3) soils of varying depth and stoniness occur. (Taylor et al. 1974, p 50) – Figure 5.*

From the 'Soil Association Map of the Adelaide Region' (Taylor, 1972) Belair Reserve (southern section) contains several soil types listed in Table 2. The podzolic soils which cover almost half of the reserve are described by Murphy et al., (1994) as having low fertility rates and poor water retention characteristics. For agriculture they are limited to grazing but with large inputs of fertiliser they can be used for cropping.

TABLE 2. SOIL TYPES IN BELAIR RESERVE (SOUTHERN SECTION)

<i>Great Soil Group</i>	<i>Soil Type</i>	<i>Soil Type Description (Taylor, 1972)</i>
Podzolic Soils	P2	Grey sandy surface over yellow, mottled clay with blocky structure on slates, shales and quartzites.
	P3	Grey sandy surface over red clay with granular structure on slates and shales.
	P4	Grey sandy surface with much ironstone gravel over yellow and mottled clay with granular structure.
Skeletal Soils	SK	Very thin soils on bedrock. Rock outcrops general.

### 3.1.3 Rainfall

Belair Reserve is situated between the 650-700 millimetre isohyets (Figure 6) according to a study by Taylor et al. (1974, p29) using data that was compiled some twenty eight years ago. Climatic data from the Bureau of Meteorology Australia (2002) for Belair is presented in Table 3.

It is worth noting the difference between the mean and median rainfall data for Belair, being 33.4 millimetres. It is preferable to use the 'median' as it represents the middle value in an array of numbers, and therefore a more accurate representation of the data set. The 'mean' is subject to variation by outlying numbers, which in terms of rainfall, can be significantly skewed by exceptionally wet or dry periods.

The climate data concurs with Charman and Murphy's (1994) observation that red and yellow podzolic soils occur in areas with average annual rainfall above 650 millimetres. This agrees with Taylor et al., (1974, p 27) who state that podzolic soils:

*...have developed generally on all kinds of parent rock on the Eden Fault Block surface. This relationship has been tied approximately to the 675 millimetre isohyet as a minimum rainfall from field observation of soil occurrences. The exceptions are for particular parent material such as calcareous rocks*

TABLE 3. CLIMATE AVERAGES OF BELAIR .

<i>Belair (Kalyra)</i> <i>Alt. 305 m 1895-1996</i>						
Month	Mean Daily Max. Temp °C	Mean Daily Min. Temp °C	Mean 9am wind speed (km/hr)	Mean 3pm wind speed (km/hr)	Median Rainfall (mm)	Mean Rainfall (mm)
Jan	26.6	14.9	14.2	15.0	20.4	24.4
Feb	26.8	15.4	14.0	14.7	13.7	24.6
Mar	24.0	14.0	14.5	14.3	22.2	30.8
Apr	20.1	12.1	14.1	14.6	52.8	58.2
May	16.4	10.1	14.7	15.6	83.6	93.2
Jun	13.2	7.8	15.3	16.5	90.2	100.9
Jul	12.5	7.0	16.4	18.7	97.6	97.5
Aug	13.8	7.4	16.8	19.5	83.1	87.5
Sep	16	8.5	17.1	17.9	67.4	73.5
Oct	19.4	10.0	16.8	17.4	54.9	58.7
Nov	22.6	11.9	15.7	16.7	32.0	40.0
Dec	24.7	13.3	15.0	16.0	25.8	34.0
<i>Total</i>	<i>19.5</i>	<i>10.9</i>	<i>15.4</i>	<i>16.4</i>	<i>689.8</i>	<i>723.2</i>

### 3.1.4 Adjacent Land Uses

Belair Reserve (southern section) is surrounded by a diverse range of unrelated land uses which inherently pose threats to its management (Figure 7).

The rehabilitated Lynton Landfill lies along the reserve's northern boundary, with bushland on the same title along part of its western boundary. Residential properties about the reserve's eastern and southern boundaries and a Trans Adelaide reserve along the Adelaide-Melbourne railway line forms a portion of its western boundary. From these divergent land uses comes the threat of weed invasion, nutrient rich stormwater run-off, litter, predatory animals and increased public use (some inappropriate). Weed invasion from residential properties and the former landfill is concerning and is one of the most difficult threats to manage.

When viewed from a topographic map, Belair Reserve is part of a greater network of interlocking reserves (Figure 8) such as Ashby Reserve and Watiparinga National Trust Reserve to the south-west, Sleeps Hill Reserve (adjacent to Watiparinga's northern boundary) and Shepherds Hill Recreation Park (National Parks and Wildlife SA) both adjacent to Watiparinga's western boundary. Council should give consideration to increasing habitat corridors between these reserves.

#### STRATEGY:

3.1.4 Council should increase habitat corridors between Belair Reserve and nearby reserves along the western slopes of the Mount Lofty Ranges

## 3.2 VEGETATION

### 3.2.1 General Description

Belair Reserve is described by Moyle et al., (1982) as a grey box (*Eucalyptus microcarpa*) woodland with golden wattle (*Acacia pycnantha*) and various shrubs such as *Olearia* sp., ferns, lilies and perennial grasses in the understorey. Boneseed and olive were noted as a serious threat to the continued survival of indigenous understorey species. A long-term weed control program was recommended. Field observations during August 2002 and previous vegetation surveys support the above description.

According to a vegetation survey by Gillis (1993) the vegetation of Belair Reserve (southern section) can be broadly classified into five major vegetation types (see Figure 9a, 9b) based upon dominant species (not all species present):

- "Grey Box, Olives and Boneseed" – as the dominant plants. This classification also contains *Acacia pycnantha*, *Acacia paradoxa*, *Allocasuarina verticillata*, other indigenous shrubs, herbs and introduced grasses and weeds. This represents approximately 70% of the reserve's flora.
- "Olives" – dense olive infestations with grey box as an overstorey, mixed with desert ash, boneseed and dog rose. This vegetation classification is situated in three main drainage



lines which flow in north-westerly and westerly directions. The most acute olive infestations are in the gully between Caroline Avenue and Kalyra Road, and the dominant gully dissecting Lot 19.

- “Grey box and Regeneration areas” – with olive, *Acacia pycnantha*, *Allocasuarina verticillata*, some native shrubs and herbs, introduced grasses and weeds. A range of environmental weeds such as olive and boneseed were being removed at the time of the survey (1993). Refer to the Bush For Life site map (Figure 2.) to see the extent of environmental weed control and regeneration that has occurred since 1993.
- “Grey Box” – with olive, *Acacia pycnantha*, *Dodonaea viscosa*, native shrubs and herbs, *Themeda triandra*, some introduced grasses and weeds. Situated on the northern boundary between the edge of the Lynton Landfill and the fire track.
- Other – across the reserve there are relatively small patches of various vegetation types such as :
  - Intact Remnant Vegetation - between Mead Street and Quarry K and L2
  - Drooping Sheoak - adjacent Quarry E and G;
  - Planted Native Vegetation – end of High Street
  - Grasses (introduced) – between railway line and crushing plant

### 3.2.2 Plant Species Richness

A flora survey undertaken by Solveig Gillis in 1993 and Trees For Life (Appendix E) revealed:

- 140 indigenous species
- 10 non-indigenous native species
- 58 non-native weed species

### 3.2.3 Significant Flora

Belair Reserve (southern section) contains twenty nine (29) indigenous plant species with a conservation rating (Table 4). The plant surveys have been undertaken by Gillis (1993-1994), Lane (1996-1997) and Bush For Life volunteers.

TABLE 4. INDIGENOUS PLANTS WITH A CONSERVATION RATING IN BELAIR RESERVE (SOUTHERN SECTION)

Plant Family and Botanical Name	Common Name	Australia	South Australia	Southern Lofty Botanical Region
ADIANTACEAE				
<i>Cheilanthes distans</i>	Bristly Cloak-fern			R
AMARANTHACEAE				
<i>Ptilotus spanthulatus</i> forma <i>spanthulatus</i>	Pussy-tails			R
CAMPANULACEAE				
<i>Whalenbergia litticola</i>	Coast Bluebell			R
CARYOPHYLLACEAE				
<i>Stellaria palustris</i> var. <i>tenella</i>	Swamp Starwort		R	R
CHENOPODIACEAE				
<i>Maireana enchylaenoides</i>	Wingless Fissure-plant			U

Plant Family and Botanical Name	Common Name	Australia	South Australia	Southern Lofty Botanical Region
<b>COMPOSITAE</b>				
<i>Chrysocephalum semipapposum</i>	Clustered Everlasting			R
<i>Senecio hypoleucus</i>	Pale Groundsel			U
<i>Vittadinia blackii</i>	Narrow-leaf New Holland Daisy			R
<b>CYPERACEAE</b>				
<i>Lepidosperma curtisiae</i>	Little Sword-sedge			N
<b>GERANIACEAE</b>				
<i>Geranium solanderi</i> var. <i>solanderi</i>	Austral Geranium			N
<b>GOODENIACEAE</b>				
<i>Goodenia albiflora</i>	White Goodenia			U
<i>Goodenia pinnatifida</i>	Cut-leaf Goodenia			U
<i>Velleia paradoxa</i>	Spur Velleia			U
<b>GRAMINEAE</b>				
<i>Danthonia auriculata</i>	Lobbed Wallaby-grass			N
<i>Danthonia linkii</i> var. <i>fulva</i>	Leafy Wallaby-grass			U
<i>Dichanthium sericeum</i> spp. <i>sericeum</i>	Silky Blue-grass			V
<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Rice-grass			N
<i>Stipa elegantissima</i>	Feather Spear-grass			U
<i>Stipa eremophila</i>	Rusty Spear-grass			U
<b>HYPOXIDACEAE</b>				
<i>Hypoxis vaginata</i> var. <i>vaginata</i>	Yellow star			N
<b>LEGUMINOSAE</b>				
<i>Acacia acinacea</i>	Wreath Wattle			N
<i>Glycine tabacina</i>	Variable Glycine		V	E
<i>Lotus australis</i>	Austral Trefoil			U
<b>LILIACEAE</b>				
<i>Lomandra sororia</i>	Sword Mat-rush			U
<b>MYOPORACEAE</b>				
<i>Myoporum viscosum</i>	Sticky Boobialla			U
<b>MYRTACEAE</b>				
<i>Eucalyptus microcarpa</i>	Grey Box			U
<b>PITTOSPORACEAE</b>				
<i>Pittosporum phylliraeoides</i> var. <i>microcarpa</i>	Native Apricot			R
<b>PLANTAGINACEAE</b>				
<i>Plantago gaudichaudii</i>	Narrow-leaf Plantain			R
<b>PORTULACACEAE</b>				
<i>Calandrinia eremaea</i>	Dryland Purslane			U

Refer to Appendix E for an explanation of keys to the conservation ratings of indigenous flora and fauna. Conservation Rating "Australia" (EPBC Act): X: extinct; EW: extinct in the wild; CE: critically endangered; E: endangered; V: vulnerable; CD: conservation dependant. Conservation Rating "South Australia" (NPW Act): E: endangered; V: vulnerable; R: rare. Conservation Rating "Southern Lofty Botanical Region" (Lang & Kraehenbuehl): X: extinct/presumed extinct; E: endangered; T: threatened; V: vulnerable; K: uncertain; R: rare; U: uncommon; Q: possibly significant, not yet assessed; N: common.

### 3.2.4 Significant Plant Communities

Turner (2001) reports that in 1995 Neagle upgraded Davies (1992 p13) conservation rating of grey box woodland to a priority 4 plant association in South Australia - previously priority 5. According to Davies (1992 p 13) grey box are poorly conserved in South Australia, that is much depleted but a few large examples still remaining in the state. In addition a provisional listing of threatened ecosystems (DEH, 2001) in South Australia lists "*E. microcarpa* Grassy Low Woodland on foothills and slopes of southern Mount Lofty Ranges" as "endangered." The unpublished report states that the ecosystem has limited distribution on hills south of Adelaide. It is heavily modified by urban sprawl and associated invasion of exotics. Only a few degraded examples exist within reserves.

### 3.2.5 Condition of Native Vegetation

Robertson (1995 p 3) suggests a simplified means of assessing condition of native vegetation for management purposes and is based upon three condition classes:

TABLE 5. CONDITION RATING SYSTEM OF NATIVE VEGETATION FOR BELAIR RESERVE (SOUTHERN SECTION)

Condition Rating	Description
1	Native vegetation in which there are few weeds
2	Disturbed vegetation in which there are many-non indigenous plants but also a variety of native plants
3	Very degraded vegetation dominated by non-indigenous plants but with some native plants present

Based upon the vegetation survey by Gillis (1993-1994) this condition class has been broadly applied to each vegetation type that has been mapped (Figure 9a, 9b). Within each vegetation type there are variances. Therefore, before undertaking bushland work based upon these conditions (ie. condition 1), a site inspection is required as a classified vegetation type in Figure 9a or 9b may contain elements of other condition classes. However, comprehensive vegetation condition mapping should be completed to simplify management actions and supervision.

Invasion by olive, boneseed and exotic grasses is widespread throughout the reserve (Figure 9a, 9b). This is not surprising considering a long history of disturbance through grazing, quarrying and urbanisation. Creek lines are largely dominated by olives and exotic grasses which will require a long-term control program. However, there will always been an influx of weeds being deposited through stormwater, wind, birds, etc. At present it is virtually impossible to stop weeds being carried in stormwater. However, community education combined with long term weed control and revegetation programs can reduce their impact.

Native grasses are widespread over the reserve and can be encouraged over the long term through timed slashing of fuel breaks, controlling weeds and direct seeding in areas with low densities.

## STRATEGY

3.2.5 Comprehensive vegetation condition mapping should be undertaken across Belair Reserve (southern section).

### 3.2.6 Relationship to other vegetation

Belair Reserve (southern section) must not be managed in isolation to surrounding vegetation, as this will only increase the impacts of degrading influences. Belair Reserve (southern section) is an important link with a number of reserves and properties along the Hills Face Zone which also act as habitat corridors.

The reserve's relationship to other nearby vegetation is summarised below in Table 6.

**TABLE 6. BELAIR RESERVE'S (SOUTHERN SECTION) RELATIONSHIP TO NEAR BY NATIVE VEGETATION**

<i>Property / Reserve</i>	<i>Distance</i>	<i>Comments</i>
Watiparinga National Trust Reserve	400 m	<ul style="list-style-type: none"> <li>- Located south-west</li> <li>- Grey box woodland</li> </ul>
Ashby Reserve	400 m	<ul style="list-style-type: none"> <li>- Directly south</li> <li>- Grey box woodland</li> </ul>
Belair Reserve (northern section)	0 m	<ul style="list-style-type: none"> <li>- Adjacent reserve</li> <li>- Grey box woodland</li> <li>- Threats – seed source of feral olives and other weeds</li> </ul>
Sleeps Hill Reserve	50 m	<ul style="list-style-type: none"> <li>- West of Belair Reserve (southern section). Railway line divides both reserves</li> <li>- Grey box woodland</li> <li>- Threats – seed source of feral olives and other weeds</li> </ul>
Shepherds Hill Recreation Park (National Parks & Wildlife SA)	1,500 m	<ul style="list-style-type: none"> <li>- South-west of Belair Reserve (southern section), adjoins Watiparinga Reserve</li> <li>- Red gum / SA blue gum / Grey box woodland – open woodland</li> <li>- Threats – large seed source of feral olives, although Belair Reserve (southern section) has an enormous seed source of its own</li> </ul>
Saddle Hill Reserve	1,100 m	<ul style="list-style-type: none"> <li>- South-west of Belair Reserve (southern section), adjoins Shepherds Hill Recreation Park and Watiparinga National Trust Reserve</li> <li>- Grey box woodland</li> </ul>

Property / Reserve	Distance	Comments
		<ul style="list-style-type: none"> <li>- Contains <i>Cullen parvum</i> &amp; <i>Eryngium rostratum</i> which have State and Southern Lofty Botanical Region ratings. <i>Cullen parvum</i> also has a national rating.</li> <li>- Threats – seed source of feral olives and other weeds</li> </ul>
Ellis Avenue Reserve	1,750 m	<ul style="list-style-type: none"> <li>- South-west of Belair Reserve (southern section), adjoins Shepherds Hill Recreation Park</li> <li>- Grey box woodland</li> <li>- Threats – seed source of feral olives and other weeds</li> </ul>
Adjacent land-use surrounding Belair Reserve (southern section)	Adjoining reserve	<ul style="list-style-type: none"> <li>- Resulting threats of residential development, railway line and landfill on the reserve include spread of weeds, illegal dumping, stormwater run-off, vandalism, inappropriate public use, fire and feral animals.</li> <li>- Some of the properties contain patches of remnant vegetation which provide fauna habitat and corridors.</li> </ul>
Wittunga Botanic Gardens	1,700 m	<ul style="list-style-type: none"> <li>- South of Belair Reserve (southern section)</li> <li>- Wittunga contains the root rot disease (<i>Phytophthora cinnamomi</i>) which due to its proximity can be carried into the reserve. Although Wittunga 's water run-off does not flow into Belair Reserve, vectors can include vehicles, humans and equipment.</li> </ul>
Hills Face Zone	Part of it	<ul style="list-style-type: none"> <li>- Important part of the native vegetation across the Hills Face Zone. Within the City of Mitcham this includes Shepherds Hill Recreation Park on its far south-western boundary to Leawood Gardens on its north-eastern boundary, turning south to take in Belair National Park and Upper Sturt. This zones captures many Council Reserves, National Parks and Wildlife SA and bushland on private property.</li> <li>- Each block of bushland is important in maintaining habitat corridors and to reduce further fragmentation of native vegetation.</li> </ul>

### 3.3 FAUNA

Council is unaware of any fauna studies conducted on Belair Reserve (southern section). However, fauna surveys have been undertaken on nearby reserves:

- Shepherds Hill Recreation Park (National Parks and Wildlife SA);
- Watiparinga National Trust Reserve.

The fauna lists from these surveys are in Appendix F. Fauna surveys have documented the presence of 71 avian species (indigenous and non-indigenous), 18 reptile species and 2 amphibian (frog) species. From the fauna identified during the survey, 21 avian and 4 reptile species have conservation ratings (Table 7).

It is possible that fauna occurring on nearby reserves also occur in Belair Reserve (southern section) based upon its close proximity, similar plant communities (grey box woodland) and part of a habitat corridor on the western slopes of the Mount Lofty Ranges. It is likely that the reserve plays an important role in providing critical habitat for indigenous flora and fauna.

TABLE 7. INDIGENOUS FAUNA WITH A CONSERVATION RATING IN WATIPARINGA NATIONAL TRUST RESERVE AND SHEPHERDS HILL RECREATION PARK (NPWSA).

CLASS	COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS		
			Metro Region	SA	MLR
AVES	Yellow Thornbill	<i>Acanthiza nana</i>			U
AVES	Eastern Spinebill	<i>Acanthorhynchus tenuirostris</i>			C
AVES	Little Wattlebird	<i>Anthochaera chrysoptera</i>			U
AVES	Dusky Woodswallow	<i>Artamus cyanopterus</i>			C
AVES	Sulphur-crested Cockatoo	<i>Cacatua galerita</i>			U
AVES	Galah	<i>Cacatua roseicapilla</i>			U
AVES	Yellow-tailed Black-Cockatoo	<i>Calyptorhynchus funereus</i>		V	V
AVES	Crested Shrike-tit	<i>Falcunculus frontatus</i>		V	V
AVES	Musk Lorikeet	<i>Glossopsitta concinna</i>			C
AVES	Superb Blue Wren Superb Fairy-wren	<i>Malurus cyaneus</i>			C
AVES	Noisy Miner	<i>Manorina melanocephala</i>			C
AVES	White-naped Honeyeater	<i>Melithreptus lunatus</i>			C
AVES	Southern Boobook	<i>Ninox novaeseelandiae</i>			C
AVES	Rufous Whistler	<i>Pachycephala rufiventris</i>			C
AVES	Spotted Pardalote	<i>Pardalotus punctatus</i>			U
AVES	Scarlet Robin	<i>Petroica multicolor</i>			U
AVES	Common Bronzewing	<i>Phaps chalcoptera</i>			C
AVES	Tawny Frogmouth	<i>Podargus strigoides</i>			C
AVES	White-browed Babbler	<i>Pomatostomus superciliosus</i>			U
AVES	Grey Currawong	<i>Strepera versicolor</i>			U
AVES	Rainbow Lorikeet	<i>Trichoglossus haematodus</i>			C
REPTILIA	Cunningham's Skink	<i>Egernia cunninghami</i>	En	V	
REPTILIA	Barking Gecko	<i>Nephurus milii</i>	U		
REPTILIA	Common Bearded Dragon/ Eastern Bearded Dragon	<i>Pogona barbata</i>	V	V	

Source: Turner (2002) and Robertson (1999).

Refer to Appendix E for an explanation of keys to the conservation ratings of indigenous flora and fauna. Conservation Rating "South Australia" (NPW Act): E: endangered; V: vulnerable; R: rare. Conservation Rating "Southern Mount Lofty Ranges" (Carpenter & Reid): X: extinct; E: endangered; V: vulnerable; R: rare; K: indeterminate; U: uncommon; C: common; I: introduced. Conservation Rating "Metro Region" (Hutchinson): Ex: extinct; En: endangered; V: vulnerable; U: uncommon.

## 4. RESERVE VALUES

### 4.1 CONSERVATION SIGNIFICANCE OF VEGETATION AND HABITAT

Grey box woodland, which is the dominant indigenous plant community in Belair Reserve (southern section), is of conservation significance. Turner (2001) reports that in 1995 Neagle upgraded its conservation rating to a "priority 4" plant association (previously priority 5 by Davies, 1992), being poorly conserved in South Australia, that is much depleted but a few large examples still remaining in the state. In addition, "grey box grassy low woodland" on foothills and slopes of the southern Mount Lofty Ranges is classified as an "endangered" threatened ecosystem of the agricultural regions (DEH, 2001).

Other features of conservation significance in the reserve include:

- 140 indigenous plant species recorded;
- 29 indigenous plant species with a Southern Lofty Botanical Region conservation rating ;
- 2 indigenous plant species with a State conservation rating;
- 71 avian species, 18 reptile species and 2 amphibian species surveyed on nearby reserves;
- 21 avian species with a Mount Lofty Ranges conservation rating (on near by reserves);
- 3 reptile species with a Metropolitan Region conservation rating (on near by reserves);
- 2 avian species and 2 reptiles with a state-wide conservation rating (on near by reserves);
- Native grasslands on the reserve ie. kangaroo grass (*Themeda triandra*), spear grass (*Stipa* sp.) weeping rice grass (*Microlaena stipoides* var. *stipoides*) and iron grass (*Loamandra* spp) are disappearing due to impacts from urban developments and agriculture;
- A small wetland fed by a freshwater spring near the crushing plant ruins;
- Part of a large habitat corridor along the western slopes of the Mount Lofty Ranges;
- In close proximity to the Watiparinga National Trust Reserve, which has significant conservation, values, ie. 46 indigenous plant species with conservation ratings and 19 native bird species with a conservation rating;
- Contains indigenous vegetation which provides an historical link to pre-European landscapes and guides future revegetation projects;
- Provides a seed source for future revegetation projects in and around Belair Reserve (southern section).

## STRATEGY

4.1 Belair Reserve (southern section) provides critical habitat for indigenous flora and fauna, which some are of conservation significance. The reserve must be managed to enhance habitat corridors, protect indigenous flora and fauna and foster regeneration of indigenous flora which fauna rely upon for habitat.

## 4.2 LANDSCAPE VALUES

Belair Reserve (southern section) contains a unique landscape with twelve disused quarries, steep slopes covered with indigenous vegetation and scattered remains of a local quarry industry. According to Wells (1995):

*"... the unique faces in this complex of workings which are now incorporated into the most beautiful and interesting walking trails in Mitcham. The great 100 ft. face of the "D Quarry" is one of the most exiting natural rock faces anyone could wish to see in the Adelaide Hills."*

Situated within the Hills Face Zone the reserve forms part of the green backdrop for the City of Adelaide and its surrounding suburbs.

The spectacular and colourful quarry faces exhibit quartzites and slate formations of the Belair Sub-Group which was formed during the Late Pre-Cambrian, in excess of 750 million years old. This a valuable educational resource, preserved by its inclusion on the State Heritage List in 1996.

From several vantage points in the reserve, views of the Gulf St Vincent and Adelaide's suburbs are fantastic. As stated above, the reserve provides the community with a link to a pre-European landscape. Since European settlement, grey box woodland which once formed the expansive Black Forest of the Mitcham Hills and nearby plains has been extensively cleared and used for agriculture and urban development. It is now a plant association requiring conservation and appreciation by the community.

According to Edwards and Spurling (1999) the Sleeps Hill Quarry Reserves have a high ecotourism value:

*"This reserve is of excellent ecotourism potential. With interpretive signs already in place, self-guiding is its major focus. The showcase of geology, bird life and native vegetation (although there is much exotic vegetation) represent a resource that should be maintained. The Adelaide to Belair train provides close linkage from Lynton Station."*

## 4.3 EDUCATIONAL, HISTORICAL OR SCIENTIFIC VALUES

The reserve contains a recognised interpretive geology trail with a pamphlet published by Mines and Energy South Australia titled - 'Sleeps Hill Quarries: A guide to the walking trail.' It is also understood that geological students have studied the quarries as part of their curriculum.



Scientific values include maintaining the genetic diversity of flora and fauna within and around the reserve. Revegetation projects should always source local provenance seed to maintain this gene pool. With a lack of scientific studies undertaken on Belair Reserve (southern section) it is difficult to assess such values. However, value must be placed on maintaining natural ecosystems as human activities have left us with only small remnants which are under severe pressure. The simple enjoyment and appreciation gained by many through interaction with the natural environment is another reason for conservation. Then there is the utilitarian argument for conserving natural ecosystems such as medicinal properties of plants, reducing salinity, sequestering carbon dioxide emissions, improving water quality and providing buffers.

## 5. RESERVE MANAGEMENT OBJECTIVES

Management objectives for the reserve must be consistent not only with relevant legislation such as the Local Government Act 1999 and Native Vegetation Act 1991, but also policies of the City of Mitcham. Council's policies regarding the management and use of woodland reserves such as Belair Reserve (southern section) are listed below. Management objectives specified in this document are consistent with the following policies:

City of Mitcham Policy 1.7.15 Biodiversity Policy:

*As custodian of lands containing significant remnant vegetation and threatened species, Council aims to ensure protection and enhancement of biological diversity in the City. The Council will:*

- *Benchmark its procedures and decision making against legislation and strategies aimed at preserving and enhancing biodiversity;*
- *Develop an understanding and appreciation among the community of the importance of biodiversity;*
- *Identify, protect and enhance significant habitats and corridors by replanting and revegetating using local seed sources;*
- *As far as practicable, provide support and supervision to community members protecting and enhancing biodiversity on Council lands;*
- *As far as practicable, prevent the removal of fallen or standing dead timber from Council woodland reserves;*
- *Minimise, as far as practicable, biodiversity impacts caused by:*
  - *Transferring weed seeds and pathogens;*
  - *Developing and operating recreation facilities;*
  - *Developing and managing trails;*
  - *Bushfire prevention works;*
  - *Construction works;*

- *Use of herbicides and pesticides;*
- *Erosion.*

City of Mitcham Policy 3.2.8 "Management of Woodland Reserves Using Watiparinga Procedures":

*It is the long term policy of the City of Mitcham to support and promote the management of its semi-natural modified woodland reserves using procedures developed by the Watiparinga Management Committee at Watiparinga and the adjacent Ashby Reserve.*

City of Mitcham Policy 3.2.17 "Use of Woodland Reserves":

*It is the policy of the City of Mitcham as to the recreational use of its semi natural modified woodland reserves, that action is taken which limits the use of those reserves to activities which do not significantly affect the natural qualities of the reserves.*

City of Mitcham Policy 3.1.22 "Water Use and Catchment Protection Policy":

*To reduce potable water consumption and to protect watercourse health in the City.*

One of the statements is that Council will: act to protect and enhance the ecological value of watercourses in the City.

Management objectives are also consistent with actions listed in Council's *Open Space Strategy 2001* under the following sections (not limited to):

- 2. Meeting Statutory Obligations;
- 6. Regional Open Space Linkages;
- 8. Providing Quality Open Space;
- 9. Open Space with Conservation Value and Natural Features of Significance.

## **5.1 ECONOMIC OBJECTIVES**

5.1.1 To employ "best management" practices in the operation and maintenance of the reserve and use proven methodologies such as the Watiparinga Reserve model. This is aimed at delivering cost effective services to the community.

5.1.2 To benchmark management operations such as weed control, revegetation and grass slashing.

## **5.2 ENVIRONMENTAL OBJECTIVES**

- 5.2.1 To protect and enhance natural ecosystems on the reserve;
- 5.2.2 To minimise and where practicable eliminate potential environmental impacts to other landholders from reserve management operations;
- 5.2.3 All management activities and public use of Belair Reserve (southern section) must not cause adverse environmental impacts where practicable. If environmental impacts are expected to result then it will be necessary for the City of Mitcham (and relevant stakeholders) to assess any management options available to minimise the impacts. If environmental impacts are considered unacceptable then a proposed activity must not proceed.
- 5.2.4 To protect and enhance indigenous flora, fauna and associated habitats within Belair Reserve (southern section), recognising that many plants and animals on and near the reserve are of conservation significance. The reserve consists of a grey box woodland, which has priority four conservation rating and is also a threatened ecosystem with an "endangered" rating under South Australia's provisional listing of threatened ecosystems (unpublished);
- 5.2.5 To maintain and enhance indigenous flora and fauna across the western slopes of the Mount Lofty Ranges, which Belair Reserve (southern section) is an important component.;
- 5.2.6 To manage Belair Reserve (southern section) using methodologies developed by the *Watiparinga Management Committee*.

## **5.3 SOCIAL OBJECTIVES**

- 5.3.1 To provide the local community with a natural woodland reserve that can be accessed and enjoyed for passive recreation with consideration given to all user groups;
- 5.3.2 To provide the community with open space;
- 5.3.3 Council in consultation with bike users will look at options for sustainable bike trails in the reserve;
- 5.3.4 To provide the community with a link to pre-European landscapes and habitats;
- 5.3.5 To provide the community with opportunities to learn about the Aboriginal, European and natural history of the reserve;
- 5.3.6 To manage the reserve in accordance with landholder obligations specified in the Country Fires Act 1999;
- 5.3.7 To reduce fuel loads through removal of exotic plants, establishment of native grasses and timed slashing of fuel breaks. Removal of native plants in accordance with "exemptions" under the Native Vegetation Act 1991 will only be undertaken where a legitimate hazard has been identified.

# 6. MANAGEMENT ISSUES & STRATEGIES

## 6.1 CONSERVATION OF INDIGENOUS FLORA AND FAUNA

### 6.1.1 Sites or Features of Significance

To guide the management of Belair Reserve's (southern section) flora it is important that all vegetation (indigenous, natives and exotics) is mapped and a condition rating applied. Once this has occurred appropriate strategies for the entire reserve can be prescribed and implemented. Weed control programs will be based upon such maps.

Weed control in native bushland will have a primary focus on removing weeds from areas with indigenous vegetation that contain relatively few weeds (condition rating 1). Areas of bushland which are highly degraded, that is dominated by weeds with some indigenous plants (condition rating 3) will be a low priority. However, degraded areas may receive high priority when they:

- contain indigenous flora with a conservation rating;
- contain priority weed species in low abundance;
- are adjacent to houses where weeds must be removed to reduce fuel loads.

The importance of protecting and conserving all indigenous vegetation (whether or not they have a conservation rating, are high or low in abundance or are in pristine areas or degraded) can not be stressed enough. All remnants must be safe guarded and managed appropriately for their survival. With this in mind, remnants of particular importance from the vegetation maps include:

- *Intact Remnant Vegetation*, *Grey Box and Regeneration Areas* and *Grey Box, Olives and Boneseed* (Bush For Life sites) (Figure 9a, 9b) – these vegetation types all contain grey box woodland which has a priority 4 conservation rating (Neagle, 1995). However, the vegetation type "Intact Remnant Vegetation" (adjacent Quarry K and L2) contains the lowest weed infestations amongst indigenous flora. Therefore, this vegetation type should receive the highest priority by management. Minimal disturbance weed control can work outwards from the centre of these areas towards surrounding vegetation classified as "*Grey Box and Regeneration Areas.*" The terrain in these locations is very steep with high quarry faces posing significant risks to persons on the site. Appropriate risk assessments must be undertaken prior to commencing works.
- *Plants with a Conservation rating* (Figure 10a, 10b) – although some indigenous flora may be in vegetation types with a lower priority, it is critical to manage these isolated remnants and degrading influences upon them. This will ensure that these remnant patches survive and may be used as a seed source for future revegetation projects throughout the reserve.

## STRATEGY

6.1.1 Protect and conserve indigenous flora by removing degrading influences upon them and undertaking appropriate management practices to encourage regeneration.

### 6.1.2 Natural Regeneration

Regeneration is occurring throughout the reserve and must be considered the primary way in which indigenous flora is re-established. Regeneration is nature's way in which species composition, density and distribution are determined.

The random regeneration that naturally occurs is difficult to replicate in revegetation programs. Regeneration is also extremely cost effective. For Council to purchase tube stock, stakes, grow bags, weed mats and plant the tube stock, it costs approximately \$5.50 per plant. Regeneration still requires management to create suitable growing conditions which predominantly entails weed control. There are substantial costs associated with good weed control, however it is required for both regeneration and revegetation programs.

Some methods that encourage regeneration include:

- Bradley and Watiparinga methods of weed control – (i) work outwards from good bush areas (few weeds) towards areas of degraded bush (many weeds), (ii) minimise environmental disturbance, and (iii) do not over clear;
- Reduce degrading influences – such as dumping of garden refuse, new walking trails into bushland and stormwater containing high nutrient loads and/or causing erosion from discharge;
- Maintaining native grasses and ground covers in fuel breaks by annually slashing. Avoid blanket spraying of herbicides which produces bare earth, resulting in further weed infestations and erosion. These are often sites from which weeds move deeper into a reserve;

## STRATEGY

6.1.2 Management actions are to focus on establishing indigenous flora by regeneration (natural process) as the primary method. This will be achieved through minimal disturbance weed control (Bradley / Watiparinga method) and minimising degrading influences.

### 6.1.3 Revegetation

As outlined above revegetation with indigenous plants will only be a supplement to regeneration. Revegetation programs must always use local provenance seed (collected from the site or within close proximity, say 500 metres) to maintain the genetic diversity of plants within the area.

Revegetation must always complement regeneration and never thwart natural processes. It should only be considered when it is deemed a cost effective action as part of an overall reserve assessment of vegetation priorities. According to Robertson (1994 p9) there may be a need to supplement natural regeneration at particular sites by seeding or planting with a clear goal to:

- Prevent weed re-invasion;
- Suppress troublesome weeds;
- Provide particular fauna habitat;
- Add to the appearance of degraded sites and foster public appreciation;
- Stabilise eroding areas;
- Rehabilitate old quarries.

In this context, there are revegetation opportunities within Belair Reserve (southern section) and include:

- Creek lines – acute infestations of exotic grasses which require significant resources for weed control and revegetation immediately after;
- Stormwater Outlets – causing serious rill and gully erosion from Mead Street and to a lesser extent Caroline Avenue. These areas must be stabilised, weeds controlled and quickly revegetated to reduce further soil erosion. Significant resources are required;
- Fuel Breaks – where clearance of indigenous plants and weeds are required to establish a fuel break, revegetate bare earth areas using indigenous grasses and ground covers to stabilise soil and reduce weed invasion;
- Dumped Refuse – once removed it may be suitable to direct seed native grasses, trees and shrubs if the area is devoid of indigenous plants;
- Exotic grass and herbaceous weed infestations – large infestations may require gradual removal by spraying or annual brush cutting before seeds matures, then revegetating with indigenous grasses, shrub and trees. Trees would normally be planted before grasses as it can be difficult to distinguish between exotic and indigenous grasses when spraying. Introduction of native grasses can be undertaken once trees have established and aggressive weeds such as phalaris have been adequately controlled.

Some guidelines to follow during revegetation include:

- Always use indigenous plants - collect local provenance seed;
- Do not disturb areas which shows signs of regeneration. Undertake a site survey when considering revegetation;
- Consider revegetation to re-introduce species or those low in numbers;

- Use pioneering tree and shrub species in degraded areas. Consider using plants that are taller than the weeds you are controlling. This will assist in follow up maintenance of the site;
- Where practicable, for each tube stock planting use a blue marker stake, grow bag and weed mat (370 x 370 mm) to maximise its chance of survival – do it right the first time! Today's opportunity may not present itself tomorrow.

Source tube stock from growers that:

- use local provenance seed;
- have current seed collection permits for the area;
- grow quality plants (not root bound, leggy or haven't been sun-hardened, etc);
- have quality assured hygiene practices to prevent the spread of *Phytophthora cinnamomi* (Pc).

## STRATEGY

6.1.3 Revegetation is only a supplement to regeneration. Revegetation must adhere to suggested guidelines and best practice methods as they are developed. Revegetation should first focus on establishing pioneering species in specific degraded areas of the reserve.

### 6.1.4 Seed Collection

Seed collection from Belair Reserve (southern section) can be utilised for revegetation programs within the reserve. However, unrestricted collection can lead to lower rates of regeneration and damage to native plants and habitats.

For Randell Park, Robertson (1994 p9) suggests allowing limited non-commercial seed collection using non-destructive methods, by collectors with a permit from the Department of Environment and Natural Resources (or equivalent). This is an appropriate policy to adopt for this reserve. It was also recommended that the activity be monitored and the policy reviewed in respects to Council's own requirements for seed.

Care must be taken not to harvest seed from non-indigenous native plants in the reserve for use in and around the reserve.



## STRATEGY

6.1.4 Allow non-commercial seed collection of common species in the reserve by permitted individuals/organisations for planting in the local area. Seed collection must not remove more than 10% of available seed at the site.

### 6.1.5 Fauna Habitat

A lack of knowledge of fauna habitats for grey box woodlands exist. It should be a high priority to update Council's database and records of emerging studies and best practice techniques in managing grey box woodlands or similar vegetation associations.

When controlling weed infestations it is important to consider indigenous flora and fauna that may be displaced. If management actions will impact on a species it will be necessary to modify the planned works, i.e. stage works, revegetate with suitable indigenous plants to replace lost habitat. It may even be necessary to refrain from weed control in an area for a period until suitable habitat is provided or a relocation program is undertaken.

## STRATEGY

6.1.5 (a) Assess fauna habitats for their potential in areas of programmed works. If works are likely to impact on fauna habitats then STOP and re-assess works, techniques and priorities – do we need to undertake these works now? Can we wait until substitute habitat is provided? etc.

6.1.5 (b) Gather information on grey box woodland ecosystems and studies and incorporate findings into management practices where practicable.

### 6.1.6 Weeds

The reserve suffers from acute environmental weed infestations and as previously stated, olive and boneseed are the dominant woody weeds. There are also a plethora of exotic grasses and herbaceous weeds that have invaded the understorey, ie. soursob, plantain, wild oats and quaking grass. Generally it is more difficult to control the herbaceous understorey weeds as opposed to olives and boneseed.

Council has concentrated its past efforts in clearing woody weeds near property boundaries and along the fire track, achieving significant success. The Bush For Life sites (volunteers) are achieving even greater results through concentrating on smaller sites, controlling both herbaceous and woody weeds. A site visit confirms their efforts with good levels of regeneration and few woody weeds.

It is apparent that on-going weed control is necessary, especially where urban development impacts upon the reserve through adjoining properties, stormwater, illegal dumping and recreation. Through these impacts, weed are always spread. Even if these impacts could be

stopped, weeds would continue to be spread from vectors such as birds, foxes and rabbits. It will never be a question whether weed control is required, but simply a question of what level is required and what resources can be committed.

In the long term as weeds are progressively removed, bushland regenerates and condition ratings improve, resources required for weed control will reduce.

Areas and species of particular weed importance include (Figure 10a, 10b):

- **South African Weed Orchid (*Disa bracteata*)** – not observed during a site visit, but is recorded in the vegetation surveys and surrounding reserves. This weed must be the highest priority for any environmental weed control program to prevent its spread throughout the reserve and neighbouring properties;
- **Italian Lavender** – infestations occurring along the fire track on the northern portion of the reserve and adjacent Quarry G and L2. This has a potential to become widely established throughout the entire reserve and requires urgent action;
- **African Boxthorn** – growing along the fire track and quarries in the south-eastern sections of the reserve. This weed should be a high priority for control as it is a proclaimed plant, difficult to treat with sharp spines and low populations exist;
- **Exotic plants and weeds that are escaping from residential properties adjoining the reserve.** Observed along all residential-reserve boundaries. Residents must be educated about the impacts of “garden escapes” and these species must be removed from the reserve. An exotic species may be retained only if it does not have a potential to become invasive;
- **All creek lines which receive stormwater and possible seepage of effluent from the United Water pump stations.** The high nutrient loads and moist conditions are feeding herbaceous weed infestations such as couch and kikuyu near the crushing plant and spring (adjacent crushing plant ruins). Olives are proliferating especially in the main gully dissecting the quarry reserve and the gully near Kalyra Road.
- **Drainage Lines carrying stormwater to creeks** – are harbouring herbaceous weeds such as soursob, olives and ash trees.
- **Fire tracks and Trans Adelaide Reserve** – annual grasses have established along fire tracks and the Trans Adelaide Reserve (between railway line and crushing plant ruins) due to disturbance. Control is required to reduce invasion from these areas into bushland;

#### 6.1.6.1 Weed Control Principles

As stated earlier, management of the reserve will be based upon methodologies developed by the Watiparinga Management Committee. For weed control this will require “minimal disturbance” techniques. Principles of the “Bradley” method are similar to the Watiparinga methodologies developed by Enid Robertson, and include:

1. **Work outwards from good bush areas towards areas of weeds** – ie. start weeding in bushland with a condition rating 1, where weed infestations are negligible. Gradually move outwards to areas with a lower condition rating.
2. **Make minimal disturbance to the environment** – bare or disturbed soil is an invitation for weed invasion. Weed control in bushland is entirely different to weed control in agriculture systems, where large areas may be sprayed or cultivated and sown to a crop or pasture to quickly cover the soil. Often selective herbicides can be used to reduce competition within the crop. In native bushland blanket spraying of weeds is not an option as many indigenous species exist which will be killed if sprayed. Therefore, when using herbicides they must be carefully selected to minimise impacts on other plants, soil, water and fauna. Minimal disturbance techniques will minimise soil disturbance by employing methods such as cutting and swabbing, spot spraying, hand-pulling, careful grubbing, brush cutting exotic grasses before seed set, etc.
3. **Do not over clear** – over clearing will also invite further weed invasion by exceeding the rate at which the weeded areas can regenerate with indigenous plants. The extent of weeding must be matched to regeneration rates of the surrounding bush.

One exception to the Bradley method is that in some instances it may be necessary to target small infestations of certain weed species irrespective of the condition of native vegetation - without necessarily removing all weed species from that area. This is to prevent highly invasive species from becoming established throughout the reserve. Some of the weeds that fit into this category occurring in the reserve include:

- South African weed orchid      *Disa bracteata* (formerly *Monadenia bracteata*)
- Cape Broom                      *Genista monspessulana*
- Olive                                *Olea europaea*
- Lavender                          *Lavandula stoechas*
- Nasturtium                        *Tropaeolum majus*
- Pussy tail                         *Pentaschistis thunbergii*
- White Arum Lily                 *Zantedeschia aethiopica*
- Mile-a-minute, Cape Ivy        *Senecio milkanioides*
- Kikuyu                              *Pennisetum clandestinum*

The weed of most concern from the list is South African weed orchid and must receive the highest priority for eradication.

### 6.1.6.2 Weed Control Techniques

The following techniques listed by Roche (2001) are suited to minimal disturbance weed control in native vegetation. Brush cutting has been added to the list as it is integral to grassy woodland areas of the reserve – i.e. residential-reserve boundaries.

#### *Hand Weeding*

When the soil is soft enough that plant roots can be removed and before flowering has occurred, ease the plant from the ground. Remove any soil attached to the roots and ensure the roots are not left in contact with the ground. Repair site damage by gently pressing back the soil and replacing any surface mulch. Leave plants scattered, not piled up. If the plant is in seed it must be removed from the site.

### *Frill and fill or Drill and fill*

Make several horizontal cuts with an axe or similar tool (frill) or drill several holes (drill) around the trunk at a downward angle into the cambium (outer green bark). Within 15 seconds of making each cut or hole, brush or inject undiluted glyphosate into the exposed cambium. Do not ring bark as this promotes suckering in some species. This method is suitable for trees while actively growing.

### *Glove of Death*

A tool devised by local bushcarers. Glue a piece of chux (or similar material) over the thumb and forefinger (palm side) of a heavy-duty chemical resistant glove. Paint the chux with neat glyphosate, grasp the plant close to the ground between the gloved thumb and forefinger, and drag your hand up the plant. This technique is suitable for plants with strap-like leaves.

### *Cut and Swab*

With loppers, cut at an angle (to maximise exposed cambium area) through the trunk of the weed below any branching. Within 15 seconds of making the cut, swab the exposed cambium with undiluted glyphosate using a Yates weedbrush or a can of glyphosate and a small paintbrush. Suitable for woody weeds and small trees.

### *Weed brush*

Use undiluted glyphosate in a Yates weedbrush or use a small paintbrush and a can of glyphosate. Suitable for weeds with a basal rosette.

### *Spot spraying*

Use a small knapsack spray unit. Do not fully pressurise the knapsack (a few pumps only) so the herbicide flows in large droplets rather than a mist, which improves accuracy and minimises off-target damage due to spray drift. Suitable for weeds which form dense clumps or thickets with no indigenous plants underneath.

### *Grub*

With minimal possible soil disturbance, remove *\*Disa* (formerly *Monadenia*) *bracteata* (South African weed orchid) and its tubers with as little disturbance as possible. Lever the plant out using a narrow blade (~2cm wide) and immediately bag to contain the thousands of dust-like seeds. Repair the site damage by pressing the soil down slightly with your foot and replacing surface mulch.

### *Brush cutting*

Target annual exotic grasses before they set seed in spring. This is particularly suited to fuel breaks and open grassland where timed brush cutting will disadvantage exotic grasses and favour native grasses. This practice has proved successful in the Watiparinga National Trust Reserve. Care must be taken to avoid damage to indigenous plants and introduction of weeds from equipment used on other parts of the reserve, and between reserves.

For a comprehensive list of weed control techniques and timing refer to Appendix G for a weeding calendar.

### 6.1.6.3 Weed Hygiene

To minimise the spread of weeds and introduction of new species between reserves, weed hygiene is a top priority. Weed hygiene practices can also be developed in association with those for *Phytophthora cinnamomi* (Pc).

Simple weed hygiene practices include:

- Thoroughly wash down and clean all equipment, vehicles, tools and boots before entering the reserve. For Pc hygiene this would include disinfection;
- Do not transport any organic material to the reserve which may contain weed seeds, stems and roots;
- Each day (where practicable) commence weed control in areas with fewest weeds and/or least invasive and progress to areas with most weeds and/or most invasive weeds ;
- Do not slash or brush cut weeds and exotic grasses with matures seed heads. However, this rule may be broken during annual slashing of fuel breaks as coordinating contractors, staff and equipment place restrictions on timing of cuts. Each season's weather also plays a major role as maturity of seed heads vary and even the number of cuts required as in spring-summer 2001/02.

#### STRATEGY

6.1.6.3 (a) Only minimal disturbance weed control is to be used on Belair Reserve (southern section) according to the Watiparinga and Bradley methods.

6.1.6.3 (b) Adopt weed hygiene practices for Council employees, contractors, volunteers, local residents and users of the reserve.

6.1.6.3 (c) Implement an action plan to address weed control within the reserve based upon conservation values, fire management and priority weeds

6.1.6.3 (d) Vigilance is required along residential-reserve boundaries where garden escapes are introduced. Undertake regular patrols of the boundaries with prompt removal of garden escapes.

## 6.2 PUBLIC USE

### 6.2.1 Recreation

Recreation in Belair Reserve (southern section) must be consistent with Objective 5.3.1:

*To provide the local community with natural woodland reserve which can be accessed and enjoyed for passive recreation.*

Passive recreation activities that are appropriate in the reserve include:

- Bushwalking;
- Jogging;
- Painting;
- Photography;
- Bird watching;
- Cycling – only on fire tracks. However this is often ignored and new tracks are formed through bushland which causes erosion and significant damage to native vegetation.

It is important that infrastructure is provided and maintained to guide the above activities to minimise impacts on the natural environment. A geological trail had been established in 1986 with excellent signs on the reserve's geology, quarry history and vegetation. Additional measures can include:

- Interpretive signs posted at all reserve entrances – stating recreation activities allowed / prohibited, importance of native vegetation on the reserve, map of trails, etc. Some of the wooden signs displaying the name of a quarry are rotted and need replacing;
- Trail markers – many are rotted and need replacing;
- Well maintained walking tracks – erosion affecting tracks near Quarry J, K and G;
- Fencing around indigenous vegetation of conservation significance or considered high value. This may tie in with any additional quarry fencing in the future.

The Bush For Life volunteers have commented on the formation of new trails by mountain bike riders. These trails damage indigenous vegetation and may also increase the spread of soil borne pathogens such as *Phytophthora cinnamomi*. Recreation pursuits such as mountain bike riding which have an increased element of risk, may increase public liability issues for Council. There is not only the risk of the rider being injured through a fall, but also non-riders (ie. bushwalkers) who are also using the same track and may be inadvertently hit by a mountain bike- rider.

Consultation may be required to assess the current recreational activities in the Reserve and community views. Instead of immediately erecting signs prohibiting certain activities, a consultative process may identify activities which can occur through minor changes to the reserve.

Access to the reserve is by at least seven points (ignoring adjacent private property) - Figure 11. This is a high number of entry/exit points and therefore increases the need for signs and impacts on native vegetation. Management of these exit/entry points also increases. The entry/exits points include:

1. High Street – fire track and road frontage;
2. High Street – end of street where the geological trail commences;
3. Caroline Avenue – entire road frontage;

4. Railway line near tunnel – Trans Adelaide have fenced sections and erected signs to prohibit people crossing the railway line to enter the reserve. This has failed to stop some residents;
5. Mead Street - road frontage;
6. Kalyra Road – road frontage and United Water easement (bitumen track);
7. Lynton Landfill

Consideration should be given to closing entrances that serve no purpose and do not have a track leading from them, this would include:

1. High Street – fence road frontage, leaving reserve access via the geological trail and fire track;
2. Caroline Avenue – fence entire road frontage. Leave access to the walking trail on the eastern end of the road;
3. Railway line near tunnel – consider adding to fencing and signage to prevent entry to the reserve from Trans Adelaide land along the railway line. A fence can even be installed on the opposite side of the railway line along Belair Reserve.
4. Mead Street - fence entire road frontage, leaving access to the walking trails;
5. Kalyra Road – most of this has recently been fenced along the road frontage as mountain bike riders have vandalised a Bush For Life site nearby.
6. Lynton Landfill – continue restricting access to the former Council depot and landfill. Repair damaged fences.

## STRATEGY

6.2.1 (a) Belair Reserve (southern section) is a natural woodland which can be accessed and enjoyed by the community for passive recreation. Council needs to maintain and where appropriate upgrade infrastructure to guide passive recreation within the reserve in an effort to minimise adverse impacts upon its natural resources (flora, fauna and soil).

6.2.1 (b) Community consultation should be undertaken to determine current recreational uses occurring in the reserve and community needs. An outcome of the consultation may be that current non-complying activities be permitted provided adequate planning and on-ground controls are implemented. This may control prohibitive activities, which at present are uncontrolled.

6.2.1 (c) The number of entry/exit points to the reserve need to be reduced by fencing. This should reduce damage to native vegetation, signage and management of these areas.

### **6.3 DRAINAGE**

Gully erosion is a serious issue in the reserve, as with many undeveloped woodland reserves in the Mitcham Hills. Most of the stormwater outlets are located only within a few metres of the kerb, and considerable distances from the creek. Therefore, stormwater run-off is often discharged at high velocities and quickly erodes the soil in between the discharge outlet and creek. These areas will be the focus of expensive remedial works if not rectified in the short term. However, erosion will continue if the stormwater outlets are not designed to halt their inherent problems. One option is to locate dissipaters at the end of an outlet and rock line its discharge route into the nearby watercourse. Examples of some stormwater drainage structures are illustrated in Figures 13 and 14.

Impacts of stormwater and their outlets include:

- Rill and gully erosion – soil loss and landscape change;
- Stream bank undercutting and bed scour;
- Increased sedimentation within the catchment;
- Increased sedimentation kills aquatic biota;
- Increased sedimentation chokes infrastructure further downstream;
- Increased sedimentation reduces channel capacity and can increase the occurrence and severity of flooding events;
- Destruction of indigenous vegetation and promotion of weeds;
- Increased nutrient loads, particularly phosphorous which kills aquatic biota and promotes a monoculture of alien species;

Stormwater outlets that require particular attention include (Figure 12):

1. Mead Street (above Quarry K) - water is discharged onto the reserve and is forming a gully on the western edge of Quarry K. This may result in the weakening of the quarry face (potential collapse) and obvious hazards along the walking track. Attempts have been made by the City of Mitcham to reduce water velocity and erosion. This includes placing large rocks at the stormwater discharge point and wooden logs that act as groins trapping sediment and directing water flow.
2. Caroline Avenue – small narrow channel has formed linking the outlet to the creek (gully). A simple remedy is to reduce water velocity and enable the stormwater run-off to flow over a vegetated swale.



## STRATEGY

6.3 Council to consider undertaking remedial works to stop further erosion in Belair Reserve (southern section) caused by stormwater discharge from outlets. Remedial works may involve installing dissipaters at the end of an outlet and rock lining its discharge routes into the nearby watercourse. Eroded sections must be stabilised and revegetated with indigenous plants. Ignoring the problem now will exasperate gully erosion impacts and multiply remedial costs in the future. Of course, Council action will be dependent upon budget allocations, if any at this stage. Perhaps this can be addressed in annual budget reviews.

## 6.4 DUMPING

Illegal dumping of garden refuse, soil and general rubbish is a common problem on reserves, especially those located in urban areas.

Impacts from rubbish dumping include aesthetics, spread of weeds, damage or death to indigenous plants, destruction of habitat and release of toxic compounds into the soil, air and/or water. Once rubbish is dumped onto a reserve, it often encourages others to do the same, therefore it's important to remove the rubbish promptly.

Dumping in the reserve is evident at the following locations and must be acted upon promptly by Council:

- Rear of houses on Hawker Street – garden and general refuse;
- Rear of houses on Mead Street (western end, across Quarry A) – wood pile that appears to be from grey box in the reserve;

## STRATEGY

6.4 (a) Council to regularly patrol the reserve for rubbish dumping, especially at the rear of houses adjoining the reserve. Council officers should issue notices to residents to remove their rubbish and dispose of it in a lawful manner.

6.4 (b) Council officers to arrange prompt disposal of rubbish on reserves where the offender can not be identified.

## 6.5 FIRE

### 6.5.1 Fire Risk Factors

Bushland reserves present an immediate fire hazard to adjacent properties and surrounding suburbs. In the case of Belair Reserve (southern section) there are a number of factors which increase the fire hazard:

- Located on the western slopes of the Mount Lofty Ranges – high fire risk region;

- Terrain – steep terrain on the majority of the reserve makes it difficult to access areas to extinguish a fire. A fire will generally travel faster burning uphill, as opposed to burning on relatively flat terrain or downhill. Houses surrounding the reserve on the southern, eastern and north-eastern boundaries are all situated at the top of slopes, where bushfires are most likely to be travelling toward;
- Vegetation – open grassy woodland. Dry grasses provide fine surface fuel loads enabling a small fire to rapidly gain momentum and burn through an area quickly;
- Nearby Reserves and property – part of a large network of open space and undeveloped woodland reserves across the hills face including the former Lynton depot and landfill, Watiparinga National Trust Reserve, Shepherds Hill Recreation Park, Saddle Hill Reserve and Sleeps Hill Reserve. A fire occurring within any of these reserves has the potential to spread into Belair Reserve (southern section);
- Community Assets – houses adjoin the reserve on its southern, eastern and north-eastern boundaries. The railway line on the western boundary separates the reserve from houses. A fire starting in Belair Reserve (southern section) has the potential to spread to other properties and surrounding suburbs;
- Deliberate Fires – the risk may increase with the reserve being situated in an urban area and easily accessed from many points. Evidence of a camp fire was observed in Quarry C.

### **6.5.2 Fire Protection Measures**

Fuel load reduction in the reserve is the most effective method in which the City of Mitcham can reduce the potential fire hazard that exists. It is also one of the few tools available to Council in reducing the fire hazard.

Fire protection measures observed in Belair Reserve (southern section) undertaken by the City of Mitcham and volunteers include (Figure 15):

- Fuel Load Reduction – indirectly undertaken as part of bushland regeneration. Weeds removed include olives and boneseed which increase elevated fuel loads. Olives are highly flammable due to oil contained in their foliage. Significant areas are virtually free of these weeds or at least contain very low juvenile populations. The City of Mitcham has recently controlled boneseed and some olives in over four hectares of the reserve (below Caroline Avenue and Kalyra Road) in 2002-2003 through a Natural Heritage Trust Project titled "Grey Box Woodland Rehabilitation in Sleeps Hill Reserve" - see Appendix H. The City of Mitcham has undertaken removal of woody weeds along the fire track in cooperation with volunteers.
- Fuel Breaks – the City of Mitcham annually slashes exotic and native grasses along reserve boundaries that adjoin residential properties – where accessible due to terrain. Fuel breaks provide some level of protection to adjoining properties in the event of small grass fires and provide access points from which the CFS may undertake back burning. Listed exemptions under the Native Vegetation Act 1991 (Appendix K) allow landowners to clear native vegetation (except significant trees - see Development Act 1993) to a width of five metres for fuel breaks. Particular attention should be focused on maintaining effective fuel breaks along the southern and eastern boundaries of the reserve, such as:

- Mead Street and Lind Avenue
- Hawker Avenue and High Street,
- Caroline Avenue to Kalyra Road

Along these critical fuel breaks (listed above) it may be necessary to form a ten metre fuel break as the land is steep and residential properties are situated at the top of the slope. This would require selective clearance of mid stratum indigenous vegetation (and all weeds) in addition to the exempted five metre fuel break under the Native Vegetation Act. **Approval is sought from the Native Vegetation Council to allow selective clearance of indigenous vegetation within this additional five metre zone.**

Significant work is required to establish an effective fuel break along the eastern boundary at the rear of properties on Hawker Avenue to High Street. This area is extremely steep and is adjacent to Quarry G. Some properties do not have a fuel break along their boundary and must remove weeds such as olives and boneseed and reduce the grass height. In some areas it may be almost impossible to clear a five metre fuel break along Council's side of the fence due to the steep quarry faces. However, most private property owners are able to clear a section on their side of the fence. Where Council can not clear a fuel break along a fence line (due to quarry faces), an effort should still be made to clear a fuel break as close as possible to the boundary. This may require clearing weeds and slashing grasses at the base of adjacent quarries. The cleared areas must link up with a nearby fuel break to form a continuous cleared line.

- Fire Track – from High Street the track heads west, downhill towards the railway line. The track meanders its way to the crushing plant ruins and runs along the edge of Quarry A and Quarry K (turnaround) and exits onto Mead Street. The track is generally in good condition. However, a small downhill section near the landfill is very rough and would benefit from additional road metal, compaction and grading.

In February 2003, the CFS recommended that Council remove mid-stratum vegetation on the low side of fire tracks within four metres of the track's edge. This is considered an essential safety measure to provide a level of protection to CFS crews and appliances fighting fires along the track. In addition Council may remove mid-stratum vegetation that pose a hazard within two metres of the track edge (high side). The plants to be targeted include olives and *Acacia paradoxa* which form a mid-stratum layer and are highly flammable. It is envisioned that pest plants will form the bulk of vegetation removed with only targeted removal of indigenous plants where necessary. Minor clearance works may occur on overhanging trees with low hanging branches trimmed back to the main trunk. The aim of any removal works will be to minimise disturbance to indigenous vegetation in an effort to foster its regeneration throughout the reserve. Maintaining indigenous vegetation in the ground layer and canopy layer will result in a defined fuel break along the track with reduced follow up maintenance costs. It is proposed that for every indigenous plant removed, at least three tube stock will be planted as replacements - away from fuel breaks. **Approval is sought from the Native Vegetation Council to enable additional clearance along fire tracks for safe access and egress by CFS personnel.**

## STRATEGY

6.5.2 (a) Continue weed eradication throughout the reserve to reduce fuel loads by targeting woody weed species and exotic grasses such as wild oats and phalaris.

6.5.2 (b) Promote and establish indigenous grasses, herbs and ground covers within fuel breaks to reduce fuel loads, slashing and weed control costs. Do not plant indigenous trees and shrubs within 20 metres of reserve boundaries to ensure that the effectiveness of fuel breaks are not compromised.

6.5.2 (c) Promote indigenous vegetation within Belair Reserve (southern section) to provide a competitive vegetation cover against weeds and reduce the overall biomass in the reserve. Dense olive infestations dramatically increase the biomass and elevated fuel loads of grey box woodlands.

6.5.2 (d) Council should maintain ten metre fuel breaks along boundaries, which adjoin residential properties. *This is subject to approval by the Native Vegetation Council for selective removal of mid-stratum indigenous vegetation beyond the exempted five metre fuel break.*

6.5.2 (e) Council should establish and maintain a ten metre fuel break at the rear of properties on Hawker Avenue and High Street (eastern boundary). *Note: Removal of indigenous vegetation beyond a fire track width of five metres requires approval by the Native Vegetation Council.*

6.5.2 (f) Upgrade a small downhill section of the fire track by adding road metal, compacting and grading.

6.5.2 (g) Remove mid-stratum vegetation along fire tracks to provide protection to CFS crews and appliances when attending fires. Clearance widths will be up to four metres wide on the low-side and up to two metres wide on the high-side, from the edge of the track. Vegetation removal to follow minimal disturbance techniques. Lopping of indigenous tree limbs may be required within these fuel breaks if deemed necessary. Any indigenous plants that are removed will be replaced by 23 tubestock of the same species and provenance, and planted well away from fuel breaks. *Note: Removal of indigenous vegetation beyond a fire track width of five metres requires approval by the Native Vegetation Council.*

6.5.2 (h) Maintain all fire tracks in good condition whilst minimising the formation of dirt and rubble piles along the track which promote weed invasion.

6.5.2 (i) Council needs to ensure that residential properties adjacent to the reserve are implementing bushfire prevention practices, have adequate fuel breaks and do not dispose of rubbish in Belair Reserve (southern section).

6.5.2 (j) Council needs to educate the local community on bushfire prevention practices which can be assisted through the CFS community awareness programs.

6.5.2 (k) Council should assist in establishing a "reserve watch" to reduce illegal dumping in the reserve, prohibited recreation activities, loitering and arsonists.

6.5.2 (l) Belair Reserve (southern section) should be included in the District Bushfire Prevention Plan with its draft maintenance plan (particularly fire section) reviewed by the District Bushfire Prevention Committee. Upon advice from the Committee, the draft maintenance plan for the reserve will be updated (if required) for endorsement by the Committee.

### 6.5.3 Ecological Fire Management

This maintenance plan can not adequately assess the appropriateness of prescribed burns for Belair Reserve (southern section). This would need to be undertaken as a separate study and must be consistent with the objectives and strategies of this maintenance plan.

Consent is required from the Native Vegetation Council for burning native vegetation as it is considered clearance under the Native Vegetation Act 1991, when used outside of listed exemptions, e.g. five metre fuel breaks.

Prescribed fires can be beneficial for indigenous plants that rely upon fire for germination. Fire can also be used as a tool in weed control programs. However, fire is a double edged sword for weed control as many weed species germinate profusely after a fire. Therefore, an intensive follow up weed control program is required following a fire. Robertson (1995) states that frequent fires (10-30 year intervals) have historically occurred in much of the fragmented vegetation in the Mount Lofty Ranges and have been associated with its degradation.

Whilst prescribed burns can immediately reduce fuel loads, it will likely increase weed invasion and only compound problems for those responsible for weed control. Weed infestations tend to increase and a vicious cycle of continued burning will be required. The impacts to native vegetation from frequent fires will be the loss of species dependent on longer periods between fires and dominance by species favouring short period in between fires. Frequent fires will affect the diversity and density of vegetation. With a lack of weed control, indigenous plants will be displaced by weeds.

However, mosaic burning is an option for bushland where it not only reduces fuel loads but can also benefit regeneration of indigenous plants dependent on fire for germination. This is a strategic approach with both biodiversity and fuel hazard reduction outcomes. Mosaic burning requires careful planning to assess areas that will benefit from this techniques, timing (hot/cool burns), follow up weed control and possible revegetation required. Underpinning the planning process will be the determination of frequency of fires in each area. Before mosaic burning is considered a viable option, Council must research the issue and consult with experts in native vegetation management and fire prevention, ie. Native Vegetation Council, local botanists, research scientists and the CFS.

#### STRATEGY

6.5.3 (a) Research appropriateness and methodologies for mosaic burning in grey box woodland to achieve biodiversity and fuel load reduction outcomes.

6.5.3 (b) Consider establishing small trial sites in different native vegetation conditions (1-3) in the reserve. Trial sites must be of manageable sizes to ensure continued follow up weed control.

6.5.3 (c) Native Vegetation Council approval is required before prescribed burns can occur in native vegetation.

6.5.3 (d) Council should keep a detailed history of fires occurring in the reserve and adjacent areas to assess impacts on indigenous vegetation and fuel loads.

## **6.6 QUARRIES**

There are twelve quarries in various locations on either side of the main gully which divides the reserve. The quarries are geologically significant and provide an example of early quarrying methods. The Department of Mines and City of Mitcham have constructed a geological trail linking all the quarries, many with interpretive signs describing the geological formations, vegetation and extraction methods (Appendix I). The trail is an excellent educational and ecotourism initiative.

Of concern is the plethora of pest plants that have established in the quarries, such as olive, boneseed and Aleppo pines. It should be a high priority to remove these weeds so visitors can view the rock faces, reduce fuel hazards and reduce further weed incursion.

Fences have been installed around parts of the quarries, mainly along steep faces that are adjacent to walking trails. It is beyond the scope of this maintenance plan to evaluate the adequacy of quarry fencing for public safety. Council should inspect the fencing for compliance to Occupational Health, Safety and Welfare legislation, regulations and rectify any deficiencies. A quarry audit commissioned by the Council in the 1990s may assist with an inspection.

### **STRATEGY**

6.6 (a) Maintain the existing geological trail and signs.

6.6 (b) Control weed infestations in quarries.

6.6 (c) Council should inspect quarry fencing for compliance to Occupational Health, Safety and Welfare legislation, regulations and rectify any deficiencies.

## **6.7 COMMUNITY EDUCATION**

Implementation of this maintenance plan will be more effective if the community are aware of the issues affecting Belair Reserve (southern section). Through education the community may increase their appreciation and value of the reserve and as a consequence take greater ownership.

Educating the community on issues such as biodiversity, illegal dumping, stormwater pollution prevention and environmental weeds can enact behavioural change. Community participation in management of the reserve can then be gained by individual residents modifying or ceasing inappropriate practices or even joining volunteer organisations (ie. Trees For Life) to actively manage native vegetation.

## STRATEGY

6.7 (a) Council to provide the Belair Reserve (southern section) Management Plan for public consultation and retain it as a public, working document.

6.7 (b) Council seeks to educate the community on issues such as biodiversity, indigenous plants, bushfire prevention, illegal dumping, stormwater pollution prevention and environmental weeds. This can be delivered through interpretive signage along trails, mail-outs, brochures, Council's website, Mitcham Community News and on-site meetings.

6.7 (c) Council should fund the establishment and annual maintenance of additional Bush For Life sites (volunteers through Trees For Life) in Belair Reserve (southern section) to involve the community in vegetation management.

# 7. IMPLEMENTATION OF STRATEGIES

## 7.1 RESERVE STATUS

The *City of Mitcham Open Space Survey 1982* classified Belair Reserve (southern section) as "Undeveloped: modified woodland – (a) semi-natural." Refer to Section 2.1 for definitions of these terms.

This description is accurate and useful for Council's internal purposes. However, a simplified classification such as "Native Woodland Reserve" or "Native Bushland Reserve" is more appropriate when stating reserve classification on signage. Council may wish to consider this change to its classification system.

As previously stated, a section of the reserve has been entered in the State Heritage Register in 1986 where the quarries are situated (CT 4115/546 Part sections 1148, 1147, 1073 and 1074 Hundred of Adelaide).

Any development occurring on a property entered into the State heritage Register must be referred to the planning authority for approval (Appendix B).

## 7.2 MANAGEMENT ZONES

Belair Reserve (southern section) has been divided into eleven (Figure 16a, 16b) management zones based upon recognisable on-ground features such as fire tracks, walking tracks and creek lines. Within each zone there are varying native vegetation condition ratings which are used to guide bushland management activities.

## 7.3 MANAGEMENT COMMITTEE

In the case of a management plan, Robertson (1995 p11) recommends the formation of a management committee to:

- coordinate, oversee and review implementation of the plan;
- resolve management issues as they arise;
- provide feedback to Council.

Council does not consider it necessary to form a committee for a maintenance plan as existing Council operations enable the processes listed above.



## **7.4 MONITORING, EVALUATION AND REVIEW**

Implementation of the maintenance plan can be assessed through evaluating on-ground actions which are derived from recommended strategies. Therefore, monitoring of actions are critical.

Some monitoring methods are listed below.

- Photo-points – monitoring weed removal programs, long term native vegetation change and erosion control;
- Vegetation Surveys – in specified areas, survey plants species to give an indication of weed control effectiveness in regeneration of indigenous vegetation. This may occur at 1-5 year intervals and involve sampling the same quadrats each survey. This will provide a good indication of whether or not management techniques are effective.
- Community Surveys – to obtain feedback on community education initiatives whether or not the “messages” are understood, relevant, changing attitudes, information gaps, etc;
- Documentation – confirmation of actions such as fuel breaks being slashed, grading of fire tracks, clean up notices issued can be recorded on inspection or activity sheets (Appendix J) as proof that they have been implemented. All activities can be recorded and entered into a database (i.e. MapInfo) for future reference and analysis.

All actions and monitoring occurring in a reserve should be recorded on an “activity sheet” and then entered into a Geographic Information System (GIS) such as MapInfo. This will provide Council and the community with a comprehensive database providing valuable historical data for a myriad of uses (i.e. budgeting) at a later date.

Annual or half yearly reviews of the maintenance plan can take place by evaluating outcomes of each action. Outcomes of the evaluation may be to alter actions for the coming year, re-prioritise actions and make changes to the maintenance plan in the next review. It is advisable to review the maintenance plan every five years.

## **7.5 RESOURCING AND PERSONNEL**

To implement the strategies in this maintenance plan it is vital that Council commits to providing adequate financial and human resources.

Belair Reserve (southern section) is relatively large at thirty-three hectares. Council's newly formed “woodland reserve crew” (two staff) will play a key role in reserve maintenance and vegetation management. However, they will have a limited number of hours to devote each year as they undertake similar works across 500 hectares of the Mitcham Hills. It is vital that Council identifies resource restrictions and ways to combat these. Establishment of more Bush For Life sites throughout the reserve can greatly assist Council.

Council will need to ensure that a staff member is assigned to implement the maintenance plan and audit on-ground works. Without one person responsible for overseeing the implementation of strategies, an uncoordinated approach will result.

## 7.6 IMPLEMENTATION GUIDE

Implementation of the maintenance plan has been summarised below in Table 8. However, this does not adequately address each strategy in the maintenance plan or provide a comprehensive weeding plan. An “action plan” should follow this document to adequately implement all the recommended strategies and available resources.

TABLE 8. IMPLEMENTATION GUIDE

TASK	ISSUES	RESPONSIBILITY	DURATION
Public Consultation	<ul style="list-style-type: none"> <li>• Ensure that stakeholders have an opportunity to comment and raise issues</li> <li>• Consider issues raised by stakeholders for inclusion in the maintenance plan</li> <li>• Review accuracy of the maintenance plan</li> </ul>	Council	Short term (4 weeks)
Adopt Maintenance Plan	<ul style="list-style-type: none"> <li>• Policy: consider changing reserve status. eg. change classification title or adopt a heritage agreement. This must be in accordance with the Local Government Act;</li> <li>• Review / endorse strategies;</li> <li>• Commitment: are existing resources adequate to implement the maintenance plan?</li> </ul>	Council	Short term
Reserve Status	<ul style="list-style-type: none"> <li>• Ensure reserve's classification is appropriate for long term protection of indigenous flora and fauna on the reserve.</li> </ul>	Council	Short term
Appoint responsible staff	<ul style="list-style-type: none"> <li>• Define roles and responsibilities;</li> <li>• Appoint staff member</li> </ul>	Council	Short term
Record Keeping	<ul style="list-style-type: none"> <li>• Establish photopoints in key areas;</li> <li>• Consider a grid system;</li> <li>• Create a standard form linked to the grid system and photopoints to monitor change in the reserve.</li> <li>• Obtain fire history of Belair Reserve (southern section) from CFS;</li> <li>• Obtain deposited plans for all titles and record all easements;</li> </ul>	Council	Short term
Monitoring	<ul style="list-style-type: none"> <li>• Establish photopoints and permanent sample sites in key areas to observe long-term change.</li> </ul>	Council & volunteers	Short term
Weeds	<ul style="list-style-type: none"> <li>• Adopt Watiparinga &amp; Bradley method (minimal disturbance of indigenous vegetation) to encourage natural regeneration and minimise weed invasions.</li> </ul>	Council staff & volunteers	Ongoing

TASK	ISSUES	RESPONSIBILITY	DURATION
Fire	<ul style="list-style-type: none"> <li>• Coordinate fire prevention with weed management.</li> <li>• Consult CFS where necessary;</li> <li>• Minimise weed dispersal in grading fire tracks and slashing fuel breaks;</li> <li>• Modify maintenance of fuel breaks to favour regeneration of indigenous grasses and groundcover plants and disadvantage the growth of exotic species.</li> <li>• Include reserve maintenance plan in the District Bushfire Prevention Plan.</li> </ul>	Council, volunteers, CFS & Bushfire Prevention Officer	Short-term
Erosion	<ul style="list-style-type: none"> <li>• Stabilise areas undergoing erosion and install stabilisation measures where necessary. Deal with the source of the problem.</li> <li>• Stormwater erosion sites will require additional resources to rectify the problems</li> </ul>	Council & volunteers	Short-Long term, ongoing.
Community Education	<ul style="list-style-type: none"> <li>• Maintain trails and interpretive signage to encourage the public to use designated trails, entry/exit points and appropriate activities.</li> <li>• Ensure that the maintenance plan is readily accessible to anyone with an interest in the area so they can see what managers aim to achieve and how.</li> <li>• Inform and advise residents on: <ul style="list-style-type: none"> <li>- Regulated activities</li> <li>- Environmental weeds and non-indigenous natives</li> <li>- Threat to vegetation from trampling and illegal dumping</li> <li>- Fire prevention practices</li> <li>- "Reserve Watch" role and other possible involvement</li> <li>- CFS community awareness programs</li> </ul> </li> <li>• Raise awareness of bushland values and general biodiversity issues</li> </ul>	Council	Short-term (signage, mail drop) then an annual mail drop
Regulated Activities	Enforce regulations prohibiting activities that damage native vegetation and habitat, i.e. unauthorised access, litter and dumping, wood collecting, woodcutting and moss rock removal.	Council	Ongoing
Feedback	<ul style="list-style-type: none"> <li>• Report regularly on progress of work and its successes/failures</li> </ul>	Council	Ongoing (6-12 month basis)
Evaluation & review	<ul style="list-style-type: none"> <li>• Based on results of monitoring, evaluate management, review priority areas, plans and resourcing.</li> </ul>	Council	5 year intervals

## 7.7 SUMMARY OF STRATEGIES

TABLE 9. HIGH PRIORITY STRATEGIES

SECTION	STRATEGY	ISSUE
2.1	Rename Belair Reserve (southern section) to "Sleeps Hill Quarry Reserve" and the existing Sleeps Hill Reserve to "O'Dea Reserve" or "O'Dea's Quarry Reserve." The remaining sections of Belair Reserve (depot and landfill) can be renamed at a later stage.	Re-naming
2.6 (a)	Communicate relevant sections of this maintenance plan with United Water.	Stormwater pollution and Habitat
2.6 (b)	When observed or notified, promptly report to United Water sewage overflow events on the reserve. Monitor occurrences and impacts of such events and take appropriate action as required.	Stormwater pollution and Habitat
2.8.2 (a)	Inspect quarry fencing for compliance to the Occupational, Health, Safety and Welfare Act (if not already done). Council should prepare a report on findings and recommended actions.	OHS&W
2.8.2 (b)	City of Mitcham to maintain and repair existing quarry fencing where damage has occurred.	OHS&W & Habitat
2.9 (a)	Review exiting reserve and "woodland crew" budget to achieve strategies in this maintenance plan.	Budgets
2.9 (b)	City of Mitcham to continue supporting existing Bush For Life sites.	Habitat
2.9 (c)	The City of Mitcham should increase the number of Bush For Life sites throughout the reserve.	Habitat
3.2.5	Comprehensive vegetation condition mapping should be undertaken across Belair Reserve (southern section).	Flora
4.1	Belair Reserve (southern section) provides critical habitat for indigenous flora and fauna, which some are of conservation significance. The reserve must be managed to enhance habitat corridors, protect indigenous flora and fauna and, foster regeneration of indigenous flora which fauna rely upon for habitat.	Flora & Fauna
6.1.1	Protect and conserve indigenous flora by removing degrading influences upon them and undertaking appropriate management practices to encourage regeneration.	Flora & Fauna
6.1.2	Management actions are to focus on establishing indigenous flora by regeneration (natural process) as the primary method. This will be achieved through minimal disturbance weed control (Bradley / Watiparinga method) and minimising degrading influences.	Flora & Fauna
6.1.3	Revegetation is only a supplement to regeneration. Revegetation must adhere to suggested guidelines and best practice methods as they are	Flora & Fauna

SECTION	STRATEGY	ISSUE
	developed. Revegetation should first focus on establishing pioneering species in specific degraded areas of the reserve.	
6.1.4	Allow non-commercial seed collection of common species in the reserve by permitted individuals/organisations for planting in the local area. Seed collection must not remove more than 10% of available seed at the site.	Flora & Fauna
6.1.5 (a)	Assess fauna habitats for their potential in areas of programmed works. If works are likely to impact on fauna habitats then STOP and re-assess works, techniques and priorities – do we need to undertake these works now? Can we wait until substitute habitat is provided? etc.	Flora & Fauna
6.1.5 (b)	Gather information on grey box woodland ecosystems and studies and, incorporate findings into management practices where practicable.	Flora & Fauna
6.1.6.3 (a)	Only minimal disturbance weed control is to be used on Belair Reserve (southern section) according to the Watiparinga Reserve and Bradley methods.	Flora & Fauna
6.1.6.3 (b)	Adopt weed hygiene practices for Council employees, contractors, volunteers, local residents and users of the reserve.	Flora & Fauna
6.1.6.3 (c)	Implement an action plan to address weed control within the reserve based upon conservation values and fire management.	Weed Control
6.1.6.3 (d)	Vigilance is required along residential-reserve boundaries where garden escapes are introduced. Undertake regular patrols of the boundaries with prompt removal of garden escapes.	Weed Control
6.2.1 (a)	Belair Reserve (southern section) is a natural woodland reserve which can be accessed and enjoyed by the community for passive recreation. Council needs to maintain and where appropriate upgrade infrastructure to guide passive recreation within the reserve in an effort to minimise adverse impacts upon its resources (flora, fauna and soil).	Recreation
6.2.1(b)	Community consultation should be undertaken to determine current recreational uses occurring in the reserve and community needs. An outcome of the consultation may be that current non-complying activities be permitted provided adequate planning and on-ground controls are implemented. This may control prohibitive activities, which at present are uncontrolled.	Recreation
6.2.1(c)	The number of entry/exit points to the reserve need to be reduced by fencing. This should reduce damage to native vegetation, signage and management of these areas.	Recreation
6.3	Council to consider undertaking remedial works to stop further erosion in Belair Reserve (southern section) caused by stormwater discharge from outlets. Remedial works may involve installing dissipaters at the end of an outlet and rock lining its discharge routes into the nearby watercourse. Eroded sections must be stabilised and revegetated with indigenous plants. Ignoring the problem now will exasperate gully erosion impacts and multiply remedial costs in the future. Of course, Council action will be dependent upon budget allocations, if any at this stage. Perhaps this can be	Erosion

SECTION	STRATEGY	ISSUE
	addressed in annual budget reviews.	
6.4 (a)	Council to regularly patrol the reserve for rubbish dumping, especially at the rear of houses adjoining the reserve. Council officers should issue notices to residents to remove their rubbish and dispose of in a lawful manner.	Illegal dumping
6.4 (b)	Council officers to arrange prompt disposal of rubbish on reserves where the offender can not be identified.	Illegal dumping
6.5.2 (a)	Continue weed eradication throughout the reserve to reduce fuel loads by targeting woody weed species and exotic grasses such as phalaris.	Fire Prevention
6.5.2 (b)	Promote and establish indigenous grasses, herbs and ground covers within fuel breaks to reduce fuel loads, slashing and weed control costs. Do not plant indigenous trees and shrubs within 20 metres of reserve boundaries to ensure that the effectiveness of fuel breaks are not compromised.	Fire Prevention
6.5.2 (c)	Promote indigenous vegetation within Belair Reserve (southern section) to provide a competitive vegetation cover against weeds and reduce the overall biomass in the reserve. Dense olive infestations dramatically increase the biomass and elevated fuel loads of grey box woodlands.	Fire Prevention
6.5.2 (d)	Council should maintain ten metre fuel breaks along boundaries, which adjoin residential properties. <i>This is subject to approval by the Native Vegetation Council for selective removal of mid-stratum indigenous vegetation beyond the exempted five metre fuel break.</i>	Fire prevention
6.5.2 (e)	Council should establish and maintain a ten metre fuel break at the rear of properties on Hawker Avenue and High Street (eastern boundary). <i>Note: Removal of indigenous vegetation beyond a fire track width of five metres requires approval by the Native Vegetation Council.</i>	Fire prevention
6.5.2 (f)	Upgrade a small downhill section of the fire track by adding road metal and grading.	Fire Prevention
6.5.2 (g)	Remove mid-stratum vegetation along fire tracks to provide protection to CFS crews and appliances when attending fires. Clearance widths will be up to four metres wide on the low-side and up to two metres wide on the high-side, from the edge of the track. Vegetation removal to follow minimal disturbance techniques. Lopping of indigenous tree limbs may be required within these fuel breaks if deemed necessary. Any indigenous plants that are removed will be replaced by 2-3 tubestock of the same species and provenance, and planted well away from fuel breaks. <i>Note: Removal of indigenous vegetation beyond a fire track width of five metres requires approval by the Native Vegetation Council.</i>	Fire Prevention
6.5.2 (h)	Maintain all fire tracks in good condition whilst minimising the formation of dirt and rubble piles along the track which promote weed invasion.	Fire Prevention
6.5.2 (i)	Council needs to ensure that residential properties adjacent to the reserve are implementing bushfire prevention practices, have adequate fuel breaks and do not dispose of rubbish in Belair Reserve (southern section).	Fire Prevention

SECTION	STRATEGY	ISSUE
6.5.2 (j)	Council needs to educate the local community on bushfire prevention practices which can be assisted through the CFS community awareness programs.	Fire Prevention
6.5.2 (k)	Council should assist in establishing a "reserve watch" to reduce illegal dumping in the reserve, prohibited recreation activities, loitering and arsonists.	Fire Prevention
6.5.2 (l)	Belair Reserve (southern section) should be included in the District Bushfire Prevention Plan with its draft maintenance plan (particularly fire section) reviewed by the District Bushfire Prevention Committee. Upon advice from the Committee, the draft maintenance plan for Belair Reserve (southern section) will be updated (if required) for endorsement by the Committee.	Fire Prevention
6.5.3 (c)	Native Vegetation Council approval is required before prescribed burns can occur in native vegetation.	Fire prevention
6.5.3 (d)	Council should keep a detailed history of fires occurring in the reserve and adjacent areas to assess impacts on indigenous vegetation and fuel loads.	Fire Prevention
6.6 (a)	Maintain the existing geological trail and signs.	Education
6.6 (b)	Control weed infestations in quarries	Habitat, Education
6.6 (c)	Council should inspect quarry fencing for compliance to Occupational Health, Safety and Welfare legislation, regulations and rectify any deficiencies.	OHS&W
6.7 (a)	Council to provide the draft Belair Reserve (southern section) Maintenance Plan for public consultation and retain it as a public, working document.	Community
6.7 (b)	Council seeks to educate the community on issues such as biodiversity, indigenous plants, bushfire prevention, illegal dumping, stormwater pollution prevention and environmental weeds. This can be delivered through interpretive signage along trails, mail-outs, brochures, Council's website, Mitcham Community News and on-site meetings.	Community
6.7 (c)	Council should fund the establishment and annual maintenance of additional Bush For Life sites (volunteers through Trees For Life) in Belair Reserve (southern section) to involve the community in vegetation management.	Community & Habitat

TABLE 10. MEDIUM PRIORITY STRATEGIES

SECTION	STRATEGY	ISSUE
2.8.1 (a)	Install boundary markers along residential-reserve boundaries using posts (preferably recycled plastic) after they have been surveyed.	Maintenance operations
2.8.1 (b)	Consider appropriate fencing around areas of high habitat value. Install entry and exit points along fences for movement of indigenous fauna.	Maintenance operations
3.1.4	Council should increase habitat corridors between Belair Reserve and nearby reserves along the western slopes of the Mount Lofty Ranges.	

TABLE 11. LOW PRIORITY STRATEGIES

SECTION	STRATEGY	ISSUE
6.5.3 (a)	Research appropriateness and methodologies for mosaic burning in grey box woodland to achieve biodiversity and fuel load reduction outcomes.	Fire Prevention
6.5.3 (b)	Consider establishing small trial sites (mosaic burning) in different native vegetation conditions (1-3) in the reserve. Trial sites must be of manageable sizes to ensure continued follow up weed control.	Fire Prevention



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