

Environmental Management Plan

for

Bonnie Doon Golf Club



Date: 7 October 2005
Prepared for: Bonnie Doon Golf Club
Prepared by: Abel Ecology

Abbreviations

AGCSA	Australian Golf Course Superintendent Association
ASS	Acid Sulphate Soils
BDGC	Bonnie Doon Golf Club
BOM	Bureau of Meteorology
CBD	Central Business District
CRZ	Critical Root Zone
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DCP	Development Control Plan
DEC	Department of Environment and Conservation
DIPNR	Department of Infrastructure, Planning and Natural Resources
DLWC	Department of Land and Water Conservation
EEC	Endangered Ecological Community
EMP	Environmental Management Plan
EPA	Environmental Protection Authority
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ESBS	Eastern Suburbs Banksia Scrub
ESD	Ecologically Sustainable Development
FOC	Flight Operations Centre
GHD	GHD Pty Ltd, formerly Gutteridge Haskins & Davey Pty Ltd
IPM	Integrated Pest Management
LEP	Local Environment Plan
LGA	Local Government Area
MSDS	Material Safety Data Sheet
NPW Act	National Parks and Wildlife Act 1974
NPWS	National Parks and Wildlife Service
NSW	New South Wales
NSWGCSA	New South Wales Golf Course Superintendent Association
NVC	Native Vegetation Conservation Act 1997
POEO	Protection of the Environment Operations Act 1997
RAG	Resource Advisory Group
ROTAP	Rare or Threatened Australian Plant
RTA	Roads and Traffic Authority
TAFE	Technical and Further Education
TSC Act	Threatened Species Conservation Act 1995
TSCA Act	Threatened Species Conservation Amendment Act 2002
WA	Western Australia

Table of Contents

1.	Introduction	19
1.1	Land ownership and lease obligations.....	20
1.2	Aims and objectives	20
2.	Site Assessment.....	21
2.1	Location.....	21
2.2	Physical and regional context.....	21
2.3	Climate	22
2.4	Geology, topography and soils	22
2.5	Catchments and drainage.....	22
2.6	Groundwater.....	23
2.7	Land Use history	23
2.8	Flora	24
2.8.1	Turfgrasses.....	24
2.8.2	Plantings	25
2.8.3	Weeds	26
2.8.4	Eastern Suburbs Banksia Scrub	28
2.9	Fauna	33
2.9.1	Mammals	33
2.9.2	Birds.....	33
2.9.3	Reptiles	33
2.9.4	Frogs	34
2.9.5	Non-native fauna	34
2.10	Habitat	34
2.10.1	ESBS.....	35
2.10.2	Areas of open turfgrass.....	35
2.10.3	Other vegetation.....	35
2.10.4	Specific habitat features.....	35
3.	Management issues	36
3.1	The Club's Lease with Sydney Water	36
3.2	Environmental Legislation, Plans and Codes of Practice.....	36
3.2.1	Legislation	36
3.2.2	Plans.....	38
3.2.3	Codes of Practice	38
3.3	Water use	38
3.3.1	Records	39
3.4	Water quality	39
3.5	Vegetation management	40
3.5.1	Eastern Suburbs Banksia Scrub	40
3.5.2	Plantings	50
3.5.3	Fencelines	50
3.5.4	Between Fairways and Holes.....	52
3.5.5	Landscaping	53
3.5.6	Weed Management	53
3.6	Fauna management.....	54
3.6.1	Native Fauna.....	54
3.6.2	Non-Native Fauna.....	54
3.6.3	Habitat for Fauna	55
3.7	Chemical use and storage	56
3.7.1	The need for Chemical Use	56
3.7.2	Pest Control	58
3.7.3	What is a Pesticide?	58
3.7.4	Pesticides Use	59
3.7.5	Pesticide Application	59

3.7.6	Record keeping	59
3.7.7	Fertilizer use	59
3.7.8	Other chemicals used	60
3.7.9	Chemical Storage Facility.....	60
3.7.10	Safety and spills.....	61
3.8	Soil conservation	61
3.9	Construction management	61
3.10	Waste management.....	61
3.11	External influences	62
4.	Management Plan.....	62
4.1	Priorities	63
4.2	Timing	63
5.	General recommendations.....	64
	Table 5.1 - Lease Arrangements	64
	Table 5.2 - Environmental legislation.....	65
	Table 5.3 - Water Use and Conservation	67
	Table 5.4 - Water quality	70
	Table 5.5 - IPM and Chemical Use Reduction and Safety	71
	Table 5.6 - Soil management	75
	Table 5.7 - Construction management	76
	Table 5.8 - Waste management.....	78
	Table 5.9 - Vegetation Management - Plantings.....	80
	Table 5.10 - Vegetation management - Weeds	83
	Table 5.11 - Vegetation management – Protection of the ESBS	86
	Table 5.12 - Vegetation management – Enhancing the ESBS.....	89
	Table 5.13 - Fauna Management	101
	Table 5.14 - Education and Outreach.....	108
6.	Site-specific Management Recommendations	113
7.	Vegetation Management Guidelines	150
8.	Bibliography.....	161
	Appendix 1. Brief history of local ESBS clearance	164
	Appendix 2. Final Determination for ESBS.....	165
	Appendix 3. Recommended methods for the collection & curation of ESBS seed.....	167
	Appendix 4. The EPBC Act – Guidelines for the Club.....	168
	Appendix 5. The TSC Act 1995 & NPW Act 1974 - Overview and Implications.....	169
	Appendix 6. NPW Act 1974 - Offences and penalties	171
	Appendix 7. The POEO Act - Overview and Implications	174
	Appendix 8. The Pesticides Act 1999 - Offences and Penalties.....	175
	Appendix 9. Section 91 License – TSC Act 1995 No 101	176
	Appendix 10. Section 95(2) Certificate & Letter of Conditions	177
	Appendix 11. Section 132c License - NPW Act 1974 No 80	180
	Appendix 12. The Club’s Section 132C Scientific Licence.....	181
	Appendix 13. Plant species used for fenceline plantings between 2000 and 2004	182
	Appendix 14. Plant Schedule	183
	Appendix 15. Pesticide Application – Record Sheet.....	195
	Appendix 16. Spray Application – Record Sheet.....	196
	Appendix 17. Fertiliser Application Record Sheet.....	197
	Appendix 18. Noxious Weeds for the Botany LGA.....	198
	Appendix 19. Example Spill Containment Procedure.....	200
	Appendix 20. General Tree Protection Measures.....	201
	Appendix 21. Dictionary and Category definitions.....	202
	Appendix 22. Abel Ecology - Company Profile.....	207

List of Guidelines

Guideline No. 1 - Protection and Management of the Eastern Suburbs Banksia Scrub (ESBS) an Endangered Ecological Community.....	150
Guideline No. 2 - Process for Restoring the ESBS	152
Guideline No. 3 - Process for treating African Love Grass adjacent to an ESBS remnant...	154
Guideline No. 4 - Process for treating African Love Grass and other weeds (when not adjacent to the ESBS).....	156
Guideline No. 5 - Method for marking out the current extent of the ESBS remnants	157
Guideline No. 6 - Tree Planting in Turf	158
Guideline No. 7 - Mass Planting	159
Guideline No. 8 - Weed Control Techniques	160

List of Figures

Figure 1 – Locality map for Bonnie Doon Golf Course.....	7
Figure 2 – Aerial Photograph of Bonnie Doon Golf Course (Dated 29 May 2004).....	8
Figure 3 - Soil map for site and surrounding area	9
Figure 4 - Botany Sands aquifer and surface catchment	10
Figure 5 - ESBS in the Sydney Basin Bioregion (NSW NPWS September 2002)	11
Figure 6 - Indicative areas of ESBS on Bonnie Doon Golf Course & Mutch Park.....	12
Figure 7 - Location of ESBS remnant vegetation, Bonnie Doon Golf Course - North	13
Figure 8 - Location of ESBS remnant vegetation, Bonnie Doon Golf Course - South	14
Figure 9 - Map of Management Zones	15
Figure 10 - Map of Management Zone A.....	16
Figure 11 - Map of Management Zone B	17
Figure 12 - Map of Management Zone C	18
Figure 13. Method for establishing a buffer alongside an ESBS remnant	155

List of Tables

Table 1.1 - Bonnie Doon Golf Course at a glance.....	20
Table 2.1 - Summary of the main weed species that occur at Bonnie Doon	26
Table 2.2 - Summary of findings from the ESBS Condition Survey 2004	31
Table 3.1 - Laws that affect the management of BDGC	36
Table 3.2 - Plans that affect the management of BDGC	38
Table 3.3 - Details of those plants whose use should be discontinued in plantings across the golf course	52
Table 5.1 - Lease Arrangements.....	64
Table 5.2 - Environmental legislation	65
Table 5.3 - Water Use and Conservation.....	67
Table 5.4 - Water quality	70
Table 5.5 - IPM and Chemical Use Reduction and Safety	71
Table 5.6 - Soil management.....	75
Table 5.7 - Construction management.....	76
Table 5.8 - Waste management	78
Table 5.9 - Vegetation Management - Plantings	80
Table 5.10 - Vegetation management - Weeds.....	83
Table 5.11 - Vegetation management – Protection of the ESBS.....	86
Table 5.12 - Vegetation management – Enhancing the ESBS	89
Table 5.13 - Fauna Management	101
Table 5.14 - Education and Outreach	108
Table 6.1 - Zone A Management Recommendations.....	113
Table 6.2 - Zone B Management Recommendations	126
Table 6.3 - Zone C Management Recommendations	138

List of Plates

Plate 1. Photograph of part of the additional 6.5 hectares looking north-west (Sept 04)	21
Plate 2. Photograph of an area of the fenceline that runs parallel with Banks Avenue that has been recently planted with ESBS species	26
Plate 3. African Love Grass (<i>Eragrostis curvula</i>) surrounding ESBS remnant B7 (Sept 04)	27
Plate 4. Two slightly different forms of <i>E. curvula</i> , shown here adjacent to ESBS remnant B6.	28
Plate 5. Single <i>Monotoca elliptica</i> stump – all that could be found of ESBS remnant B10 in the 2004 survey	30
Plate 6. Black-shouldered Kite observed on Bonnie Doon in September 2004	33
Plate 7. Photograph of Jacky Lizard <i>Amphibolurus muricatus</i> , taken near the soil storage bays, northern half of the course (March, 2004)	34
Plate 8. Photo of remnant B7, completely surrounded by African Love Grass (Sept 04)	41
Plate 9. Inappropriate planting in ESBS remnant B3d (<i>Photo courtesy of the NSW National Trust</i>)	42
Plate 10. Pile of mulch at the edge of remnant B11b, looking SE toward Eastgardens Shopping Centre	42
Plate 11. Brush matting used for erosion control in ESBS remnant B2. (<i>Photo courtesy of the NSW National Trust</i>)	44
Plate 12. Here the clearing of African Love Grass has exposed <i>Lepidosperma laterale</i> (<i>Photo courtesy of the NSW National Trust</i>)	44
Plate 13. Flower spikes of <i>Xanthorrhoea resinifera</i> in remnant B3d (photo taken in September 2004)	48
Plate 14. Recent fenceline plantings (Area E3) adjacent to the 9 th fairway and Banks Avenue (Sept 04)	51
Plate 15. Dense planting of <i>Poa labillardieri</i> around the northern edge of one of the bunkers directly behind the 18 th green	53
Plate 16. Examples of Jacky Dragon habitat from around the golf course (Sept 2004)	55
Plate 17. Photo of <i>Xanthorrhoea resinifera</i> one of the ESBS species that provides similar dense habitat as <i>E. curvula</i>	56
Plate 18. General waste and recycling bins at the western end of the carpark	62
Plate 19. Recycling bin for paper and cardboard located, near the Clubs main maintenance shed	62
Plate 20. Example of a sign currently placed at the edge of ESBS remnant B7 (Sept 04)	87
Plate 21. This photo shows the clearing of ALG in small patches to minimise erosion and habitat disturbance.	93
Plate 22. Photo of <i>Banksia paludosa</i> within remnant B6.	115
Plate 23. Photo showing one of the newly cleared and planted area's, with an area of dense <i>Romulea rosea</i> in the foreground (Sept 2004)	118
Plate 24. Photograph of fenceline plantings (E2a) looking NE (Sept 2004).	119
Plate 25. Photo of the <i>Monotoca</i> seedling that have come up in area E3 (Sept 04).	120
Plate 26. Gap in B18 with Heffron Rd in background. The front of the remnant is surrounded by ALG (Sept 2004).	127
Plate 27. Photo of ESBS remnant B19, looking north (Sept 2004).	128
Plate 28. Photograph of planted area P1a looking Sth (Sept 2004).	129
Plate 29. Photograph of fungus (Sept 04)	134
Plate 30. Photo of part of remnant B7 looking west (Sept 04).	138
Plate 31. Photo of remnant B8d looking south (Sept 04).	139
Plate 32. Remnant B9 looking south (Sept 04).	139
Plate 33. Photograph of B11b taken from the 11th fairway, with a stand of Honey Myrtle (<i>Melaleuca amillaris</i>) to the right (Sept 04)	140
Plate 34. Photo of the 14th fairway, looking south from the 14th green. Area P10 extends along the right hand side of the fairway (Sept 04).	142



Figure 2 – Aerial photo of Bonnie Doon Golf Course (29th May 2004)

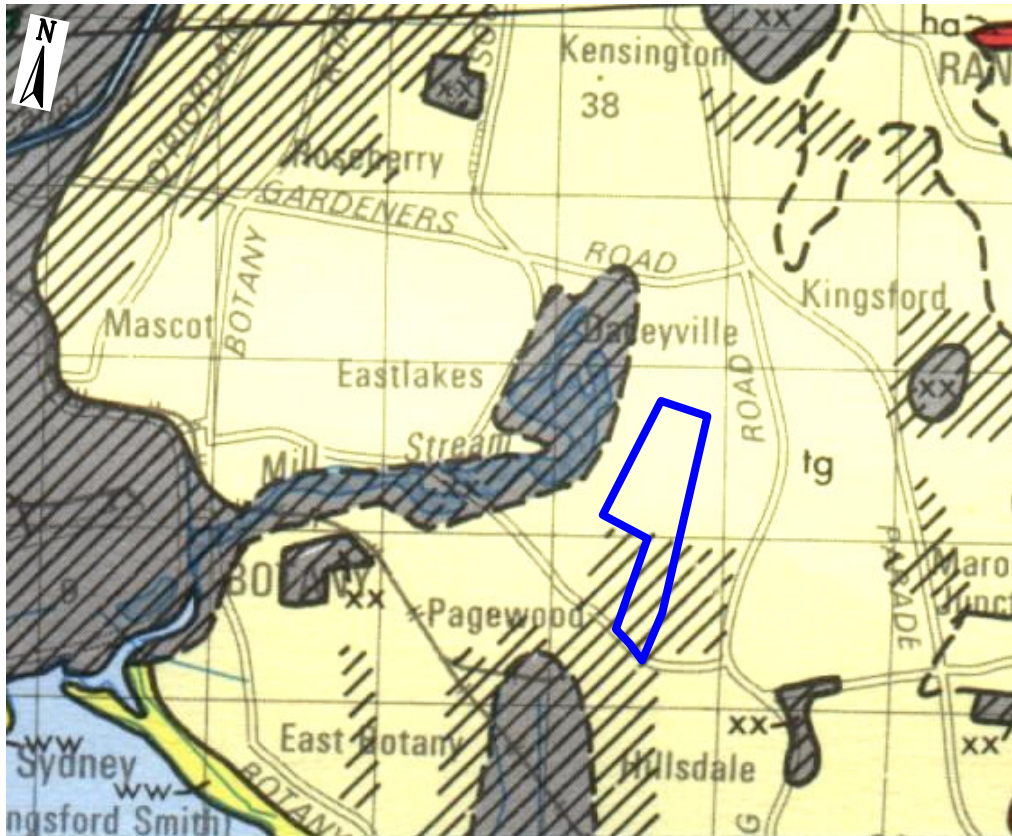


Figure 3. Soil map for site and surrounding area



Site locality

Scale: grid square = 1km

KEY

AEOLIAN

tg (Tuggerah) - Landscape - gently undulating to rolling coastal dunefields. Soils - deep on dunes and Podzol/Humus Podzol intergrades on swales.

COLLUVIAL

ha (Hawkesbury) – Landscape - rugged, rolling to very steep hills on Hawkesbury Sandstone. Soils – shallow, discontinuous Lithosols/Siliceous Sands associated with rock outcrop; Earthy Sands, Yellow Earths and some Yellow Podzolic Soils on inside of benches and along joints and fractures; localised Yellow and Red Podzolic Soils associated with shale lenses; Siliceous Sands and secondary Yellow Earths along drainage lines.

MARINE

ww (Woy Woy) – Landscape - level to gently undulating non-tidal beach ridges on marine sands. Soils - deep Siliceous Sands and occasional Podzols on sandy rises, Humus Podzols in poorly drained areas, Calcareous Sands near beaches.

DISTURBED

xx Cleared

Source: Soil Conservation Service of NSW Soil landscape series sheet 9130, Sydney, 1983.

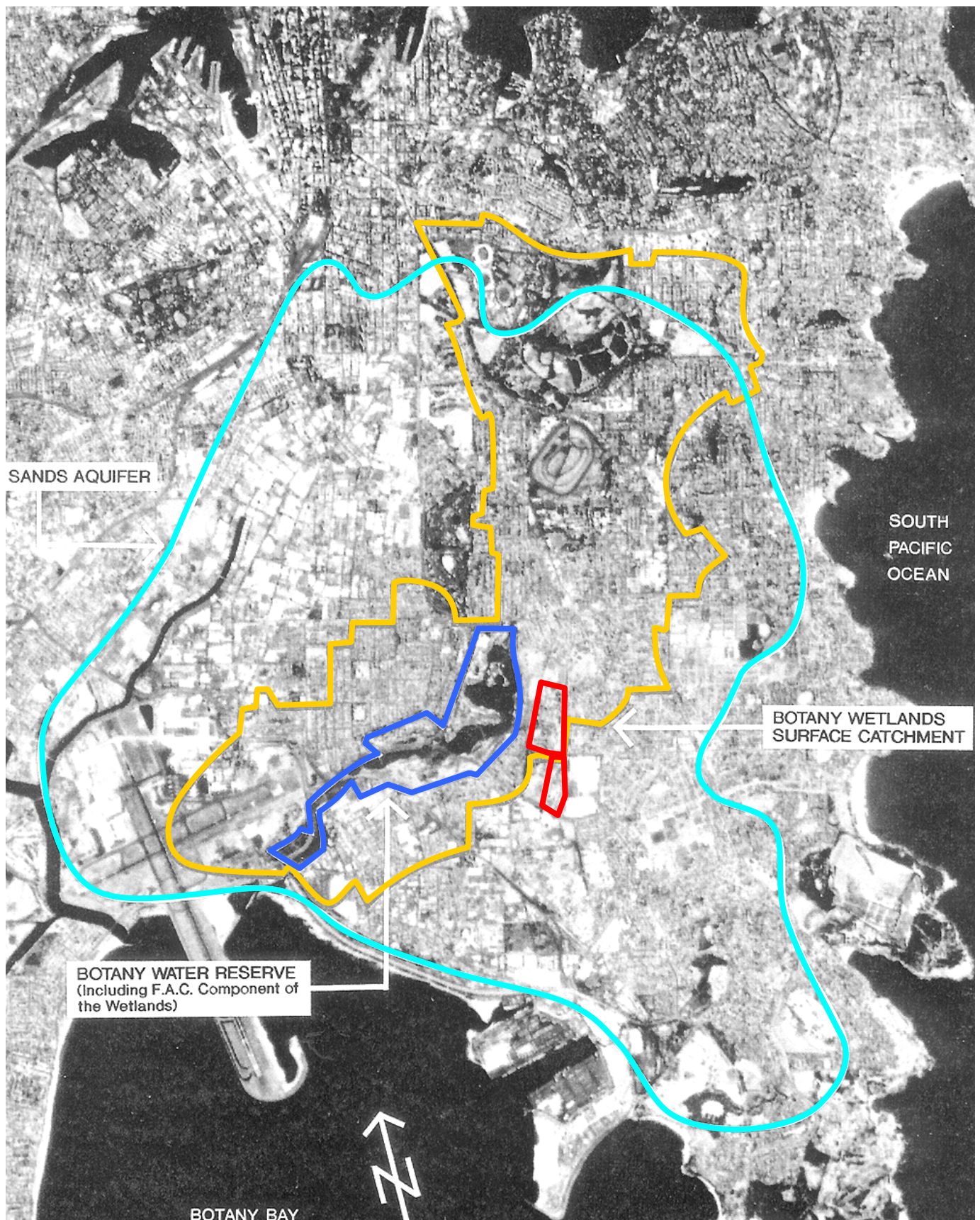


Figure 4. Botany sands aquifer and surface catchment boundary

- | | |
|--|---|
| Bonnie Doon golf course | Botany wetlands surface catchment |
| Botany sands aquifer | Botany water reserve |

Map extract from "Botany Wetlands Draft Environmental Management Plan", Figure 1.
Gutteridge Haskins & Davey Pty Ltd (March 1993). Image © CNES 1990.

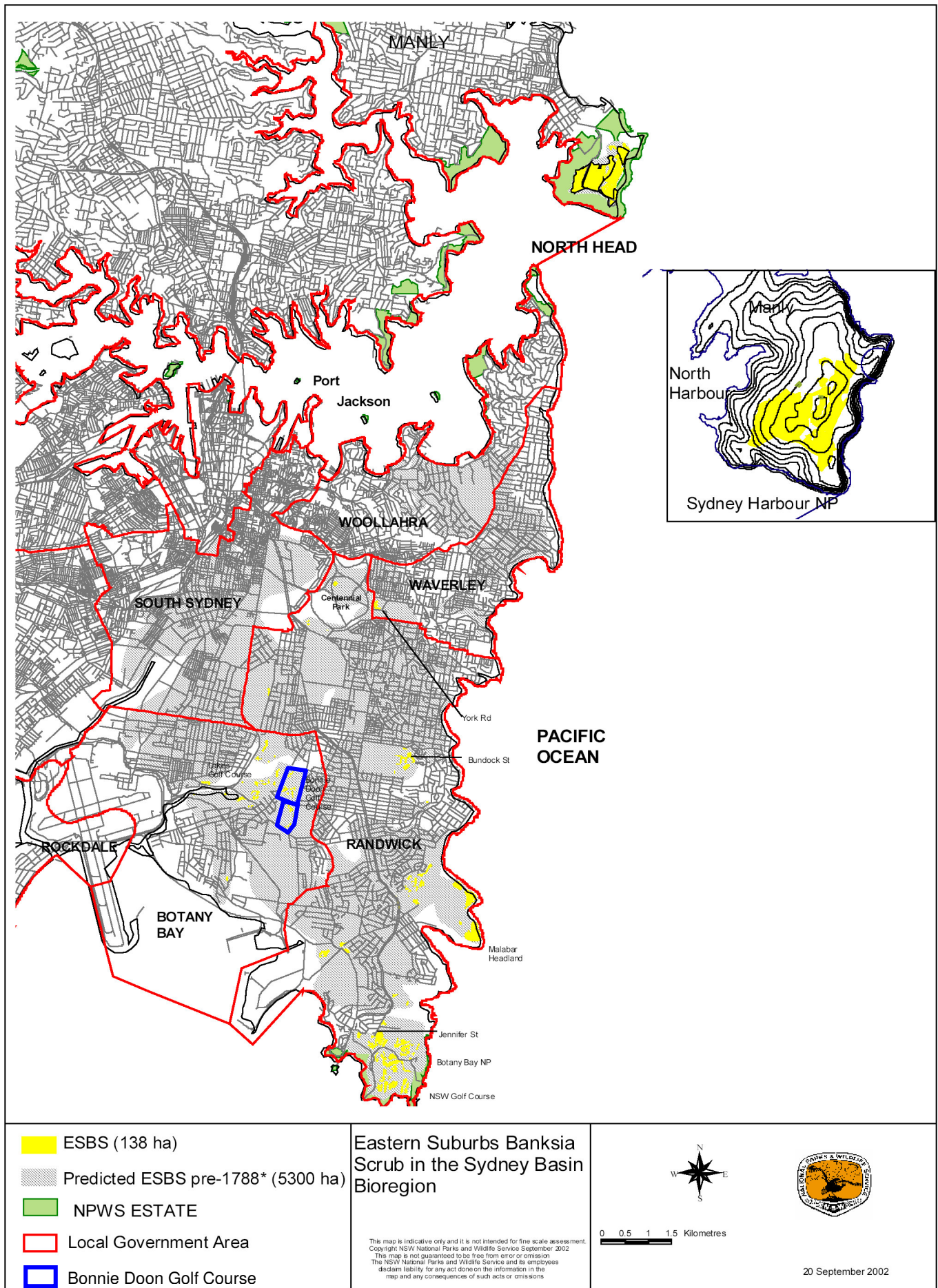


Figure 5. ESBS in the Sydney Basin Bioregion

This map is used by permission; © NSW National Parks and Wildlife Service, September 2002

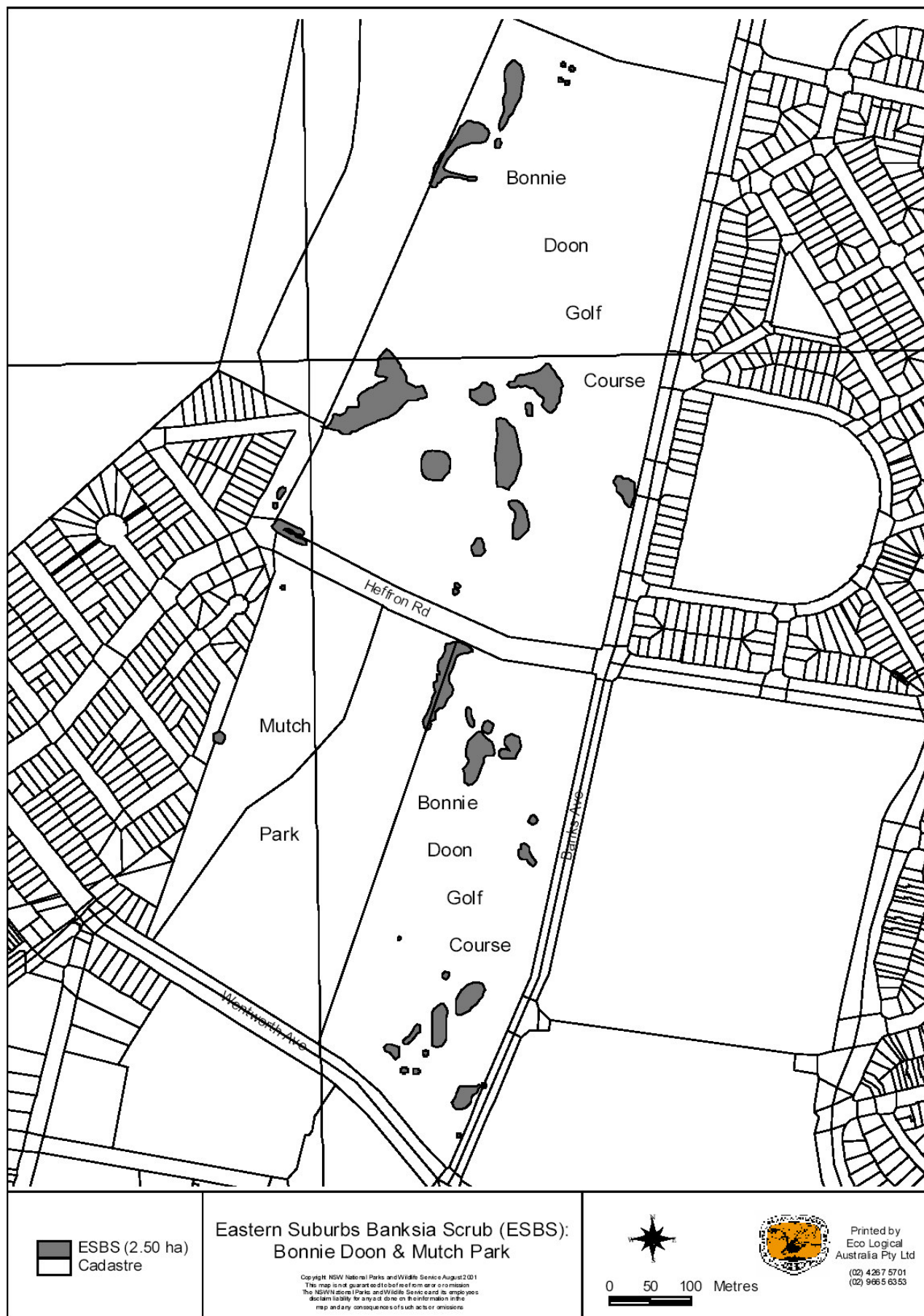
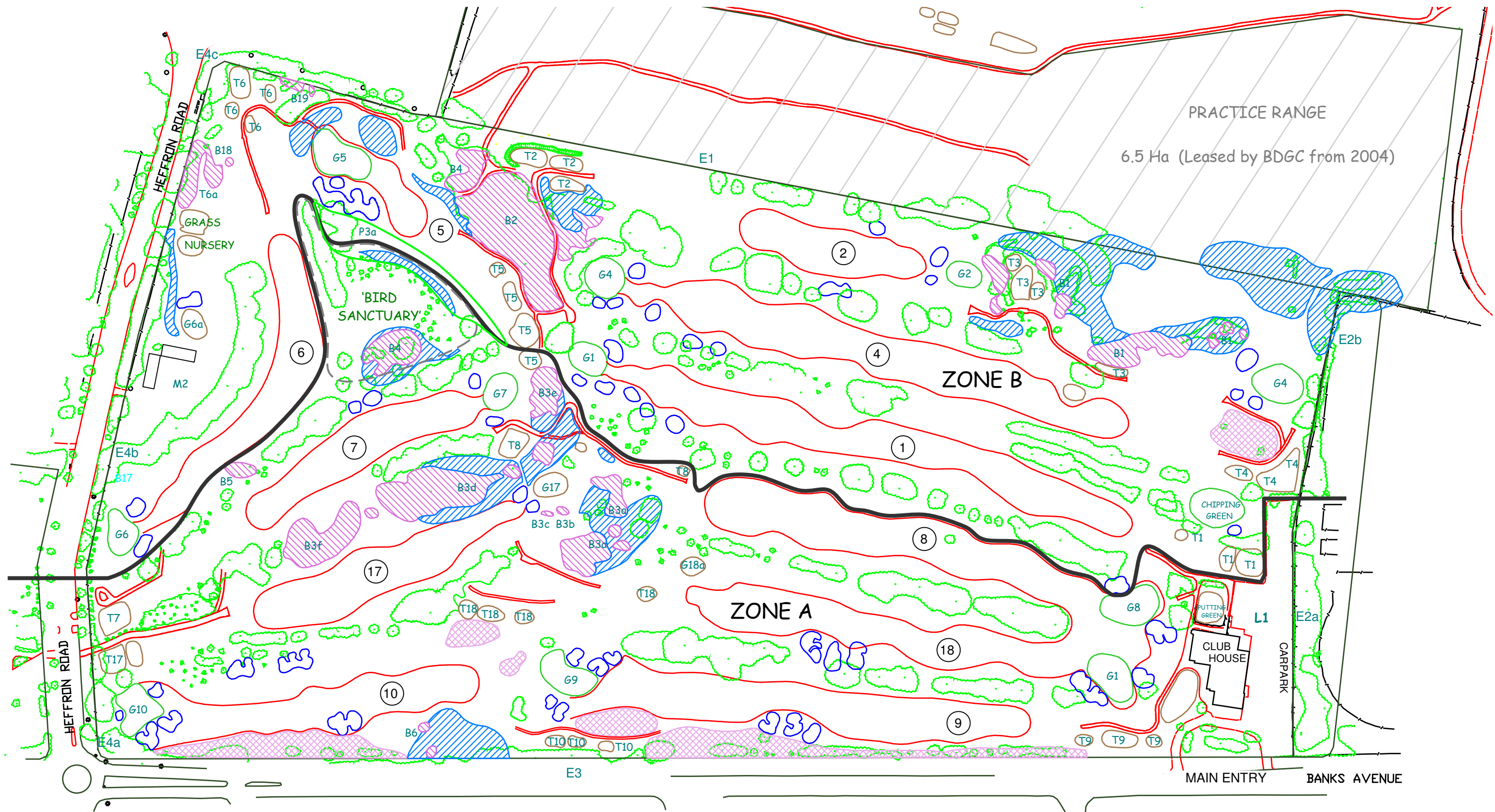


Figure 6. ESBS on Bonnie Doon Golf Course & Mutch Park

This map is used by permission; © NSW National Parks and Wildlife Service August 2001



ESBS – Existing remnants

ESBS - Areas planted to ESBS

African Love Grass - dense tussock cover

Existing tracks (sealed/unsealed)

Base map supplied by Bonnie Doon Golf Course.

© Blue Mountain Wilderness Services Pty Ltd, 2005

Green

Tee

Sand bunkers

Landscape/fairway/other plantings

Edge (boundary)

Landmark

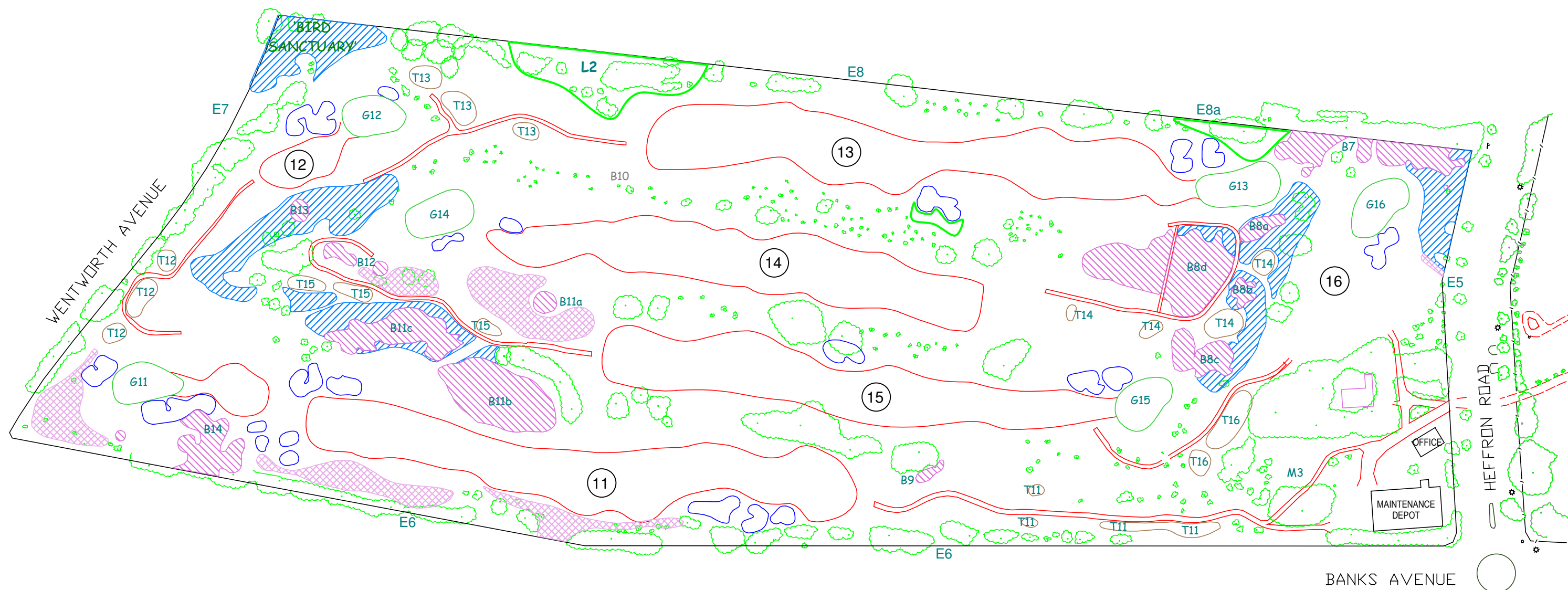
Planting

Maintenance & operations

0 50 m 100



**Figure 7. Location of remnant ESBS vegetation
Bonnie Doon Golf Course / North**



- ESBS – Existing remnants
- ESBS - Areas planted to ESBS
- African Love Grass - dense tussock cover
- Existing tracks (sealed/unsealed)

- Green
- Tee
- Sand bunkers
- Landscape/fairway/other plantings

- Edge (boundary)
- Landmark
- Planting
- Maintenance & operations

0 50 m 100



**Figure 8. Location of remnant ESBS vegetation
Bonnie Doon Golf Course / South**

Base map supplied by Bonnie Doon Golf Course.

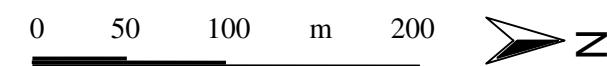
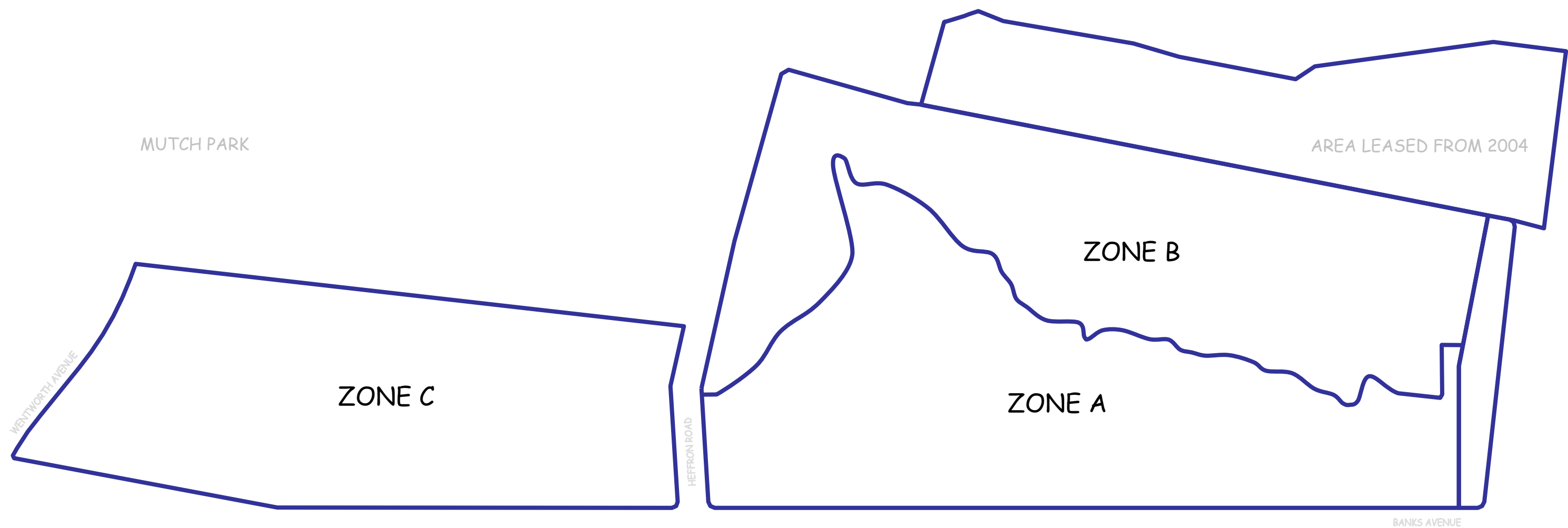


Figure 9. Map of management zones

Base map supplied by Bonnie Doon Golf Course.

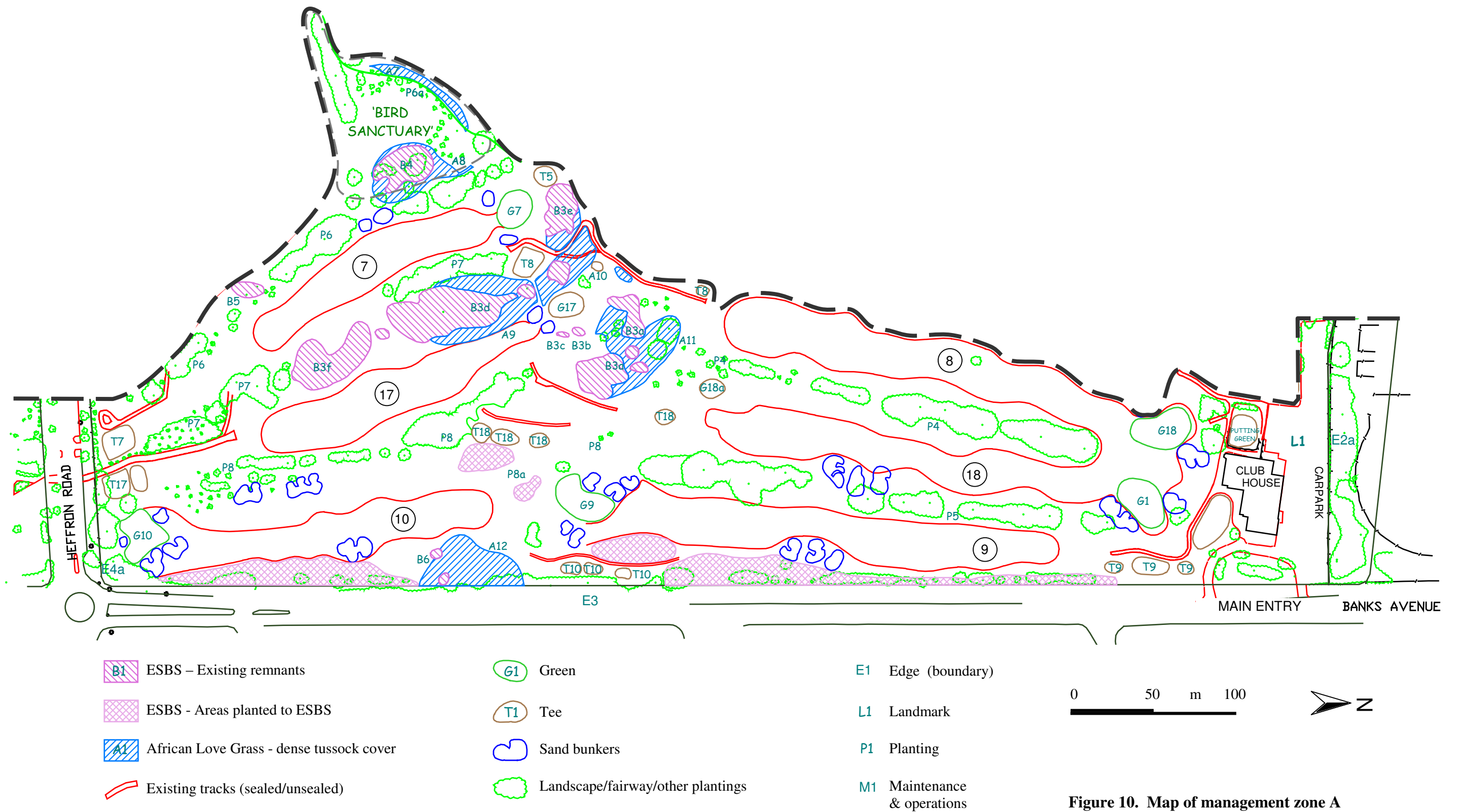
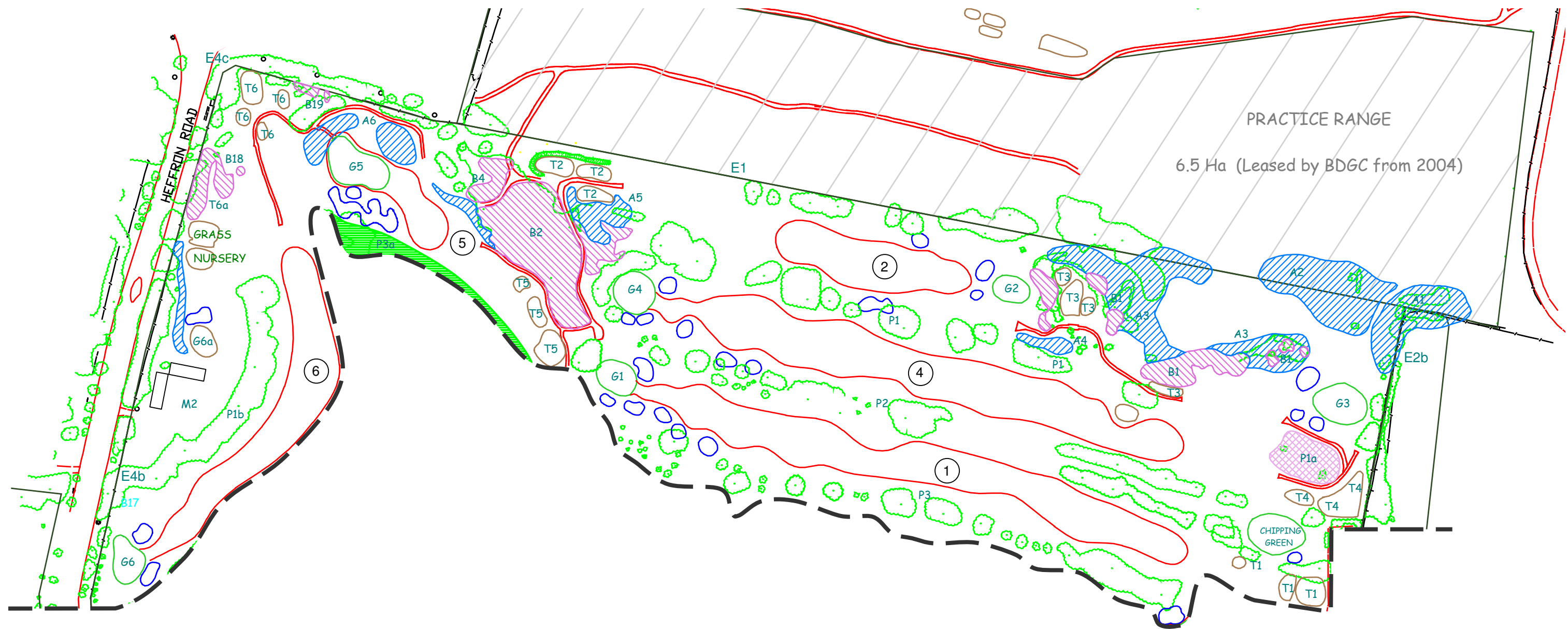


Figure 10. Map of management zone A

Base map supplied by Bonnie Doon Golf Course.



B1 ESBS – Existing remnants

B1a ESBS - Areas planted to ESBS

A1 African Love Grass - dense tussock cover

E1 Existing tracks (sealed/unsealed)

Base map supplied by Bonnie Doon Golf Course.

© Blue Mountain Wilderness Services Pty Ltd, 2005

G1 Green

T1 Tee

S1 Sand bunkers

L1 Landscape/fairway/other plantings

E1 Edge (boundary)

L1 Landmark

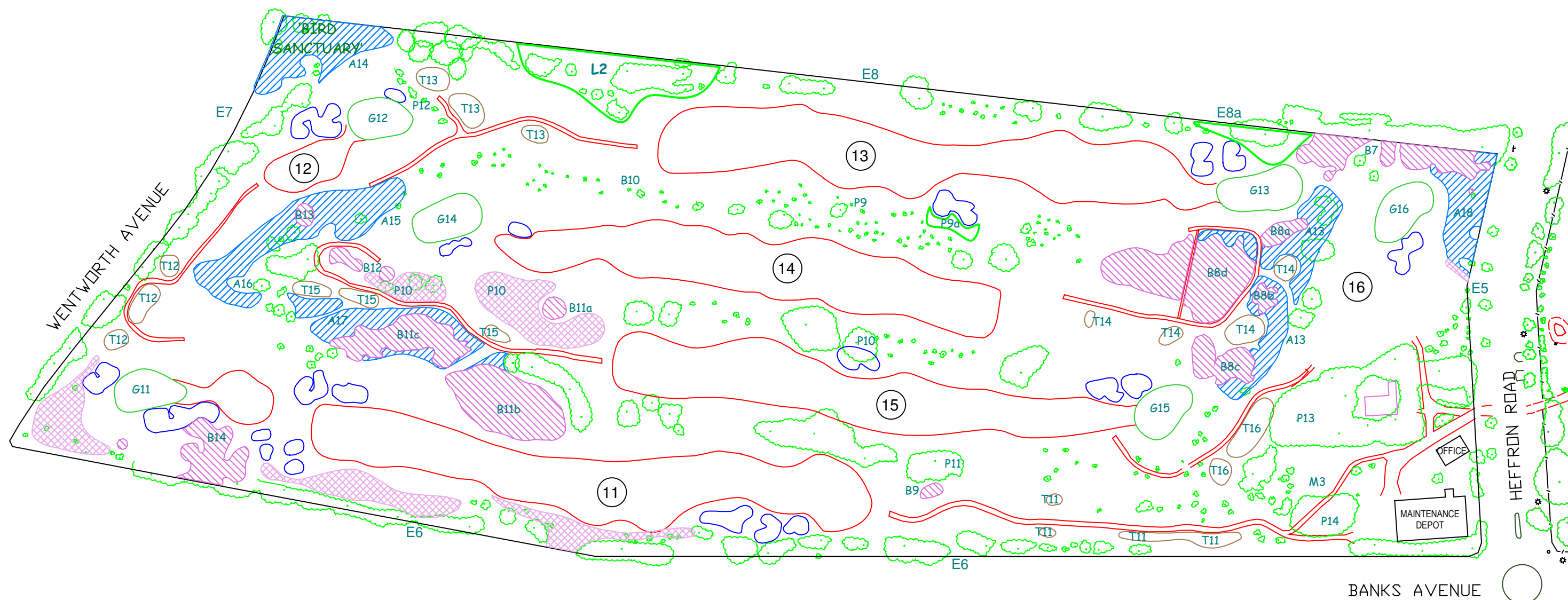
P1 Planting

M1 Maintenance & operations

0 50 m 100

N

Figure 11. Map of management zone B



- B1 ESBS – Existing remnants
- A1 ESBS - Areas planted to ESBS
- A1 African Love Grass - dense tussock cover
- Existing tracks (sealed/unsealed)

- G1 Green
- T1 Tee
- Sand bunkers
- Landscape/fairway/other plantings

- E1 Edge (boundary)
- L1 Landmark
- P1 Planting
- M1 Maintenance & operations

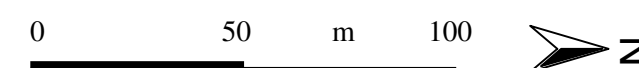


Figure 12. Map of management zone C

Base map supplied by Bonnie Doon Golf Course.

1. Introduction

Founded in 1897, Bonnie Doon Golf Club (BDGC, the Club) is Sydney's third oldest golf club and the sixth oldest club in New South Wales. Consistently ranked in the top six courses in Sydney, the Club enjoys Championship and Group One status. The Club manages a beautiful, highly regarded golf course, set in a park-like landscape that contains significant pockets of the Endangered Ecological Community, Eastern Suburbs Banksia Scrub (ESBS). The course is also one of three golf courses that lie near or adjacent to the Botany Wetlands on land owned by Sydney Water. The other two are The Lakes and Eastlakes Golf Courses.

In 1997 the Club commenced the process of developing a Landscape and Environment Plan, with the intended aim of improving the overall landscape quality of the course, and in particular to better protect and manage the remnant vegetation on the course. As part of new lease arrangements with Sydney Water, the club is now required to prepare an Environmental Management Plan (EMP). The requirements of the EMP are set out in Clause 12 of the lease. The Club has already spent considerable time, energy and resources developing the Landscape and Environment Plan 1997-2007. That document focussed particularly on vegetation management. The EMP required by Sydney Water looks at a much wider range of environmental management issues, such as fauna management, pesticide use, water use and quality, waste management and construction management. Additionally, it provides an opportunity to review the progress of the Landscape and Environment Plan, and to refine it where necessary.

The golf course occupies an area of approximately 41 hectares. In 2004 the Club entered into an agreement of permissive occupancy over an additional 6.5 hectares of land to the west of the 2nd and 3rd holes. The northern portion of this land is utilised as an informal practice area. The remaining portion of the land is densely vegetated mostly with exotic weeds and is not used for any specific purpose. The Club has plans to re-develop the land. They are currently working to address important environmental and legal issues, which need to be resolved before they can re-develop the site.

Unlike the other two nearby golf courses (Eastlakes Golf Course and The Lakes Golf Course), Bonnie Doon does not lie directly next to the Botany Wetlands. This does not mean, however, that its management practices do not have the potential to impact on the Wetlands. There are complex interactions between the wetlands and the Botany aquifer. Bonnie Doon irrigates directly from the Botany aquifer and most rain falling on the course moves subsurface into the aquifer. There is potential, due to the nature and scope of activities necessary in running a golf course, for pollution and or contamination of surface and or ground water sources.

One of the most characteristic and important features of the golf course is the presence of remnant pockets of the Endangered Ecological Community Eastern Suburbs Banksia Scrub. This community once covered extensive areas of Sydney's Eastern Suburbs. Less than 1% remains. The presence of this community places significant obligations upon the Golf Club. However, the goal of protecting and enhancing these areas is not inconsistent with good golf course management. In fact the ESBS remnants are a valuable natural asset and their protection and enhancement have potential to benefit the Club enormously.

The range and scope of this EMP is as directed by the Sydney Water lease conditions. The Stormwater Manager for Sydney Water, Robyn Sim, has had ongoing input into this report.

The EMP has been developed in close association with club management, including the Superintendent, David Scaife, former Horticulturalist Ben Marsden, current Horticulturalist

Ben Starr, General Manager, Stewart Fenton, Club President Allan Coles, and other board members.

Initial work on the EMP was carried out by Kate Low and Associates, who were unable to complete the Plan. The EMP was completed by Abel Ecology.

Table 1.1 - Bonnie Doon Golf Course at a glance

Item	Description
Ownership	Bonnie Doon Golf Course is situated on land owned by the Sydney Water Corporation
Lease Arrangements	BDGC holds a 30-year lease with a 20-year option
Area	41 hectares + 6.5 Ha added to the leasehold in 2004
Zoning	The land is zoned 6(a) - OPEN SPACE AND RECREATION
Key Features	• 18 hole golf course (par 71) • Has an open "links" style layout • Sydney's third oldest golf club • Has Championship and Group One status • Buildings: club house (including kiosk), green keeper's cottage, service compound (fertiliser storage shed and maintenance shed) • Approximately 2.5 hectares of Eastern Suburbs Banksia Scrub occurring as 13 separate remnants (Abel Ecology, 2005).

1.1 Land ownership and lease obligations

Bonnie Doon Golf Course is located on land owned by Sydney Water. The Club holds a 30-year lease with a 20-year option with Sydney Water. Under clause 12 of the lease, the Club must prepare an EMP. The EMP:

“must set out a programme of measures to be undertaken by the Lessee for the protection and enhancement of the natural resources existing in or upon the Premises and for the minimisation of any adverse environmental impacts arising from the Lessee’s Business. The EMP must be consistent with ESD principles.....” (Clause 12.2)

The EMP must be reviewed every year and be submitted to Sydney Water for approval, along with the results of any monitoring carried out during the year (clause 12.6). Every second year the Club must provide Sydney Water with an environmental audit report, which reports on the implementation of the EMP (clause 12.7).

1.2 Aims and objectives

When developing the Landscape and Environment Plan, Bonnie Doon developed the following aim:

“To enhance the environment of Bonnie Doon Golf Course by creating a landscape that gives an improved golfing experience, is aesthetically pleasing and environmentally sustainable, while also increasing the efficiency of maintaining the course.”

While that aim still applies, this Environmental Management Plan has a broader focus, being to assist Bonnie Doon Golf Club to protect and enhance the natural environment on and around the course, and to minimize the impact of golf course operations on the environment.

2. Site Assessment

2.1 Location

Bonnie Doon Golf Course, lies approx 9 km south of the Sydney CBD in the suburb of Pagewood (Figure 1). The Course is bounded by Banks Avenue to the east, the David Phillips Sports Field to the north, vacant land and Mutch Park to the west, and Wentworth Avenue to the south. Heffron Road bisects the course. The main entry point to the Clubhouse is via Banks Avenue. An aerial photograph of the course is given at Figure 2.

2.2 Physical and regional context

The golf course occupies an area of approximately 41ha. The topography of the course is typical of the Botany Sands, comprised of gently undulating sand dunes.

In March 2004 6.5 hectares of additional land, located immediately to the west of the existing course, was added to the Bonnie Doon leasehold (Plate 1.). BDGC has plans to expand and rearrange selected golf holes and construct new facilities and amenities including a practice range using the additional land.



Plate 1. Photograph of part of the additional 6.5 hectares looking north-west (Sept 04)

The course sits within a highly urbanised and industrial precinct of south-east Sydney. A high proportion of the area is characterised by medium density residential development. To the south lie major transport terminals, refineries and other large industrial operations. Sydney Airport is less than a kilometre away.

In contrast to the highly developed characteristics of the area, there is also a high proportion of open space. Developed recreation facilities include six golf courses and Centennial Park. Beaches such as Maroubra and Coogee are within 5 km. The Botany Wetlands, located only a few kilometres from the course, are a significant feature of the region. The wetlands provide fauna habitat and form part of a corridor through the eastern Sydney region. They are recognised on a national and international scale as habitat for migratory birds.

2.3 Climate

Average annual rainfall at Botany Bay is around 1150mm, falling on 105 days per year. Most rain (approximately 70%) falls in major storms, which come from the SE-SW in January-July (Leeson, 1987, p26). Average summer maximum temperatures are 26° C, with the maximum temperature recorded being 45°C. Average winter minimum temperatures are 8°C, with the lowest temperature recorded being 0°C (Benson and Howell, 1990).

There are few or no frosts, but the site is very wind exposed. Most of the course is under irrigation, so is not reliant on rainfall. The pockets of remnant vegetation are generally not irrigated, and rely mostly on natural rainfall (Low & Associates and Ondinea, 1998).

2.4 Geology, topography and soils

Bonnie Doon lies on the Botany Sands, which are unconsolidated Aeolian dunes sands. These are wind blown sands from the Quaternary period. The soils are deep, almost pure sand, have very low water-holding capacity, and tend to be water repellent (hydrophobic). A soil map of the site and the surrounding areas is given in Figure 3. Generally the sand grains are fine to medium, and very infertile. These soils are subject to extreme wind erosion hazard and high water erosion hazard (Chapman and Murphy, 1989). The water table is high, often only metres from the surface.

Although none have been identified, the course has potential to contain Acid Sulphate Soils (ASS). ASS only become a problem if exposed to air, which can occur after drainage or excavation works. In 1998 the NSW Government released an Acid Sulfate Soil Manual and Acid Sulfate Soil Planning Maps for the City of Botany Bay. These resources help to guide developments that involve the disturbance and excavation of soils within the City of Botany Bay LGA.

The golf course is characterised by gently undulating plains with little local relief. This is typical of the Botany Sands landscape. It provides naturally good topography for golf. Bonnie Doon is one of the few areas of Botany that have not been mined for sand, and subsequently filled, and thus retains a topography which is substantially similar to the original condition (Low and Ondinea, 1998).

2.5 Catchments and drainage

The course lies within the Botany Wetlands catchment, which covers an area of approximately 20 km sq. The catchment extends from Botany Bay in the south to Oxford Street and Moore Park Road in the north (Figure 4). Residential housing is the dominant land use in the catchment, taking up 54%. A further 29% is open space, quite a high proportion for the south-east of Sydney. The remainder is made up by 17% commercial/industrial use, which includes a small portion of Sydney Airport. No major commercial centres are located wholly within the catchment area. (GHD, 1993 p12 &13).

Two characteristics make the catchment distinctive within the Sydney Region; the sandy soils and the presence of an aquifer. These characteristics have been the stimulus for industrial development within the catchment (GHD, 1993, p12).

The sandy soils of the course have a high soil infiltration capacity. Most rain falling on the pervious parts of the course drains directly into the soil and moves subsurface. In heavy rainfall events low-lying areas of the course become waterlogged, which may last for extended periods.

The Botany Wetlands, located to the west of Boonie Doon Golf Course, consist of a chain of eleven ponds, the larger of which are open water with fringing vegetation. They include the Lachlan Swamps, Mill Pond, Mill Stream and Engine Pond. The ponds are part of a large coastal freshwater wetland system that lies partially on and adjacent to both The Lakes and East Lakes Golf Courses. Complex interactions between surface water runoff and the Botany Sands Aquifer occur in the Botany Wetlands. The water quality of the wetlands is affected by both water sources. Contamination of the Botany Wetlands comes from a range of sources. Most pollution to the Botany Wetlands comes from a range of diffuse sources in the catchment. Pollutants are washed into the Botany Wetlands with every rain event.

2.6 Groundwater

Underlying the course is the Botany Sands Aquifer, which covers an area of approximately 18300 hectares (Figure 4). The aquifer covers an area between Mascot in the west, Botany in the south, Kensington in the north and Coogee in the east. It has an average thickness of 15 metres (Sim 1992; p11 in Anheluk, 1994). Overall, the direction of flow is predominately southerly, towards Botany Bay (City of Botany Bay, 1999 p17).

Groundwater quality is a significant issue for the Botany Sands Aquifer. Typically the groundwater is low in salinity and slightly acidic (City of Botany Bay 1999 p17). The aquifer is vulnerable to pollution due to its permeable nature and the overlying urban and industrial development on the Botany Sand Beds (City of Botany Bay 1999 p17). Past activities have led to significant decline in groundwater quality.

Bonnie Doon draws its irrigation water directly from the Botany Sands Aquifer. The direction of groundwater flow as a result of infiltration on the course is to the west away from Banks Avenue toward the Botany Wetlands (Douglas Partners, 2003). Although of degraded quality, the groundwater is of sufficient quality for irrigation.

A previous landfill area occurs beneath Astrolabe Park, north of the golf course. This landfill has been identified as a major source of pollution affecting the quality of water associated with the underlying aquifer and the Botany wetlands. The landfill site ceased operations in 1975 and was turfed and landscaped in 1978 (Jankowski and Knight in GHD p.13).

The additional 6.5Ha of land leased by BDGC in 2004, was also used for limited landfilling between 1938 and 1965. No monitoring has been carried out to determine the effect of this landfill on groundwater or the Botany Wetlands. Nevertheless it would be expected that the quality of the groundwater would be degraded based on the evidence provided for Astrolabe Park.

2.7 Land Use history

A brief history of local ESBS clearance is given in Appendix 1.

Existing Golf Course

Prior to European occupation the land now comprising Bonnie Doon Golf Course was inhabited by aboriginal people from the Kameyagal groups of the Dharug language group (Turbet, 1989). The surrounding area was rich in resources and probably supported a relatively high population density. In particular, the nearby Botany wetlands would have provided many resources including fresh water, reeds, fish and other foods (Anheluk, 1994).

There are no known aboriginal sites remaining around the wetlands or on Bonnie Doon Golf Course.

The site first became a golf course in 1937, when the New Metropolitan was formed. The clubhouse dates to this time. The original course was a pure links course, with few trees (Milburn 1997). Bonnie Doon amalgamated with the New Metropolitan in 1947, following their forced move from Kogarah, due to the expansion of Kingsford Smith Airport. The course was extensively remodelled in the early 1950's. Photographs from that time show a course that is still mainly treeless. Remnants of Eastern Suburbs Banksia Scrub are evident in many photographs. The "Back Six" (holes 11-16) were remodelled in 1994 (Milburn, 1997).

The 9th and 10th holes have been remodelled in recent years. As of September 2004 the site consists of an 18 hole, par 71 championship golf course.

Additional 6.5 hectares

Extensive landfilling commenced on the site in 1965 and continued until 1970 when the area was capped and regraded. During that time the area was filled mostly with construction rubble but also with putrescible waste. Historical evidence indicates that this land was used for sand mining, probably in the early 1970s, and then subsequently filled using potentially contaminated materials.

The northern portion of the land is currently utilised as an informal practice area. The remainder of the land is densely vegetated mostly with exotic weeds and is not used for any specific purpose. BDGC has plans to expand and rearrange selected golf holes and construct new facilities and amenities including a practice range using the additional land.

2.8 Flora

A survey of vegetation on the golf course was undertaken by Abel Ecology in 2004. Full details of the survey methodology and results are provided in the report 'Baseline Flora and Fauna Condition Report' produced in 2005.

Vegetation on the site includes large-scale turfing with various exotic species, fairway plantings, screening/fenceline plantings, landscaping around buildings, car parks and amenity areas, maintained lawns, areas with dense tree/shrub/herb layer weed invasion, and small pockets of Eastern Suburbs Banksia Scrub (ESBS).

For the purposes of this Plan vegetation occurring on the course has been placed into 4 broad groups: turf grasses; plantings; weeds and the ESBS.

2.8.1 Turfgrasses

The playing surfaces of Bonnie Doon Golf Course consist of the following varieties of turfgrass:

- Tees – Couch *Cynodon dactylon*, Kikuyu *Pennisetum clandestinum*
- Greens – Bent *Agrostis* sp. and 'Winter Grass'
- Fairways and surrounds – Kikuyu and Couch

Other grasses occur on fairway margins as part of a mixed sward and include the weeds African Love Grass *Eragrostis curvula*, Prairie Grass *Bromus catharticus*, Panic Veldt Grass *Ehrharta erecta*, *Ehrharta calycina*, Parramatta Grass *Sporobolus africanus* and Buffalo Grass *Stenotaphrum secundatum*. Native species that occur in these areas include Brown's Love Grass *Eragrostis brownii* and Wallaby Grass *Austrodanthonia* sp.

Couch and Bent Grass are known to be better suited to the climatic conditions experienced at Bonnie Doon than other turf varieties like Kikuyu and Wintergrass. For this reason, the Club

has commenced a process of gradually removing the Kikuyu and Wintergrass and replacing them with other more suitable varieties that better suit the local climatic conditions (David Scaife, pers. com.).

2.8.2 Plantings

Bonnie Doon Golf Course is characterised by extensive areas of plantings. These areas were surveyed by Abel Ecology in 2004. Plantings along fairways and around tee areas include both exotic and native species, most of which are now mature trees. New plantings have been made along some fencelines in recent years, consisting principally of species that are characteristic of the ESBS.

Sydney region native canopy species include Sydney Peppermint *Eucalyptus piperita*, White Stringybark *E. globoidea*, Rusty Fig *Ficus rubiginosa*, Spotted Gum *Corymbia maculata*, River Peppermint *E. elata*, Tallowood *E. microcorys*, Swamp Mahogany *E. robusta* and the Paperbark *Melaleuca quinquenervia*. Other trees include *Eucalyptus* sp. (pilularis), and *Eucalyptus* sp. (scoparia). Non-local native tree species include *E. nicholii*, *Eucalyptus* sp. (West Australian), *Eucalyptus* sp. (a Red Gum) and *Agonis flexuosa*. Small tree/shrub species include Coastal Tea-tree *Leptospermum laevigatum*, Honey Myrtle *Melaleuca armillaris* and Water Gum *Tristanopsis laurina*.

An established grove of Coast Myall *Acacia binervia* is located between the south ends of the 7th and 17th fairways.

Planted exotic species include Monterey Pine *Pinus radiata*, *Pinus (nigra)*, *Pinus pinaster* and New Zealand Christmas Bush *Metrosideros excelsa*. Several of these species have also been planted along fencelines.

Additional species planted in small groups and scattered individuals on fencelines include Lemon-scented Gum *Corymbia citriodora*, a large Bunya Pine *Araucaria heterophylla*, on the south-east corner of the north course and mature Coral Trees *Erythrina x sykesii* (a weed) occur on the south-east corner of the southern course and along the southern fence of the north course.

Like Centennial Park and other golf courses in the region, Monterey Pines (*Pinus radiata*) were planted extensively over the course in the 1950's on the recommendation of the then director of the Royal Botanic Gardens. At other times there were extensive plantings of non-indigenous natives and exotics, such as Coral Trees. Some species have thrived, others have only just survived.

Many of these trees are not a suitable species for the golf course, and they are therefore gradually being removed. There are very few Coral Trees or WA Willow Myrtle remaining on the golf course in 2004. In most places, the exotic trees have been replaced with species that form part of the Eastern Suburbs Banksia Scrub community. In particular the fencelines surrounding the golf course are gradually being planted out with ESBS species.



Plate 2. Photograph of an area of the fenceline that runs parallel with Banks Avenue that has been recently planted with ESBS species

2.8.3 Weeds

Table 2.1 provides a summary of the main weed species found to occur at Bonnie Doon in the 2004 survey undertaken by Abel Ecology. Noxious weeds, environmental weeds and weeds of turf are indicated. Not all weeds of turf are included.

Table 2.1 - Summary of the main weed species that occur at Bonnie Doon

Botanic name	Common name	Noxious	Env	Turf
<i>Acacia saligna</i>	Willow-leaf Wattle		*	
<i>Acetosa sagittata</i>	Turkey Rhubarb		*	
<i>Ageratina adenophora</i>	Crofton Weed		*	
<i>Cestrum parqui</i>	Green Cestrum	W2	*	
<i>Cortaderia selloana</i>	Pampas Grass	W2	*	
<i>Conyza</i> sp.	Fleabane		*	*
<i>Digitaria</i> sp.	Summer Grass			*
<i>Eleusine indica</i>	Crowsfoot			*
<i>Eragrostis curvula</i>	African Love Grass		*	
<i>Erythrina x sykesii</i>	Coral tree		*	
<i>Ipomoea (cairica)</i> ,	Morning Glory		*	
<i>Lantana camara</i>	Lantana	W2	*	
<i>Opuntia</i> sp. (<i>O.stricta</i>)	Cactus	W4f		
<i>Parietaria judaica</i>	Wall Pellitory	W3		
<i>Paspalum dilatatum</i>	Paspalum		*	*
<i>Poa annua</i>	Winter Grass			*
<i>Ricinus communis</i>	Castor Oil Plant	W2		
<i>Romulea rosea</i>	Onion Grass			*
<i>Salpichroa organifolia</i>	Pampas-Lily-of-the-Valley		*	
<i>Senecio madagascariensis</i>	Fireweed		*	
<i>Tradescantia fluminensis</i>	Wandering Jew		*	

Areas of significant weed invasion

An area of significant weed invasion occurs on the northern half of the golf course around the maintenance and storage bays and include the Coral Tree *Erythrina x sykesii*, Black Locust *Robinia pseudoacacia*, Giant Reed *Arundo donax*, Tree Lucerne *Chamaecytisus palmensis*, Castor oil Plant *Ricinus communis*, Fennel *Foeniculum vulgare*, Lantana *Lantana camara* and Kikuyu *Pennisetum clandestinum*.

Areas with significant weed invasion on the southern half of the golf course include 'Flagstaff Hill' and the area referred to as the 'Bird sanctuary'.

The largest area of land affected by a significant weed infestation is the newly leased area to the west of the 2nd hole. This area includes Fennel *Foeniculum vulgare*, and the Giant Reed *Arundo donax* (sometimes referred to as Bamboo). Fennel occurs as scattered clumps and isolated plants and Giant Reed occurs as localised stands. The environmental weeds Morning Glory *Ipomoea (cairica)*, a climber/twiner, and the herb Pampas-Lily-of-the-Valley *Salpichroa origanifolia* are also common in this area and along the boundary with the 2nd fairway.

African Love Grass (Eragrostis curvula)

A weed of particular concern at Bonnie Doon is African Love Grass (*Eragrostis curvula*), which covers extensive areas of the course. First introduced to the area by the Soil Conservation Service following the construction of Wentworth Avenue, (Peter Brown, Superintendent, Lakes Golf Club, pers. comm., Dec 2001) this weed has thrived on the infertile soils of the Botany Sands. Extensive areas of African Love Grass occur on all other golf courses in the area. The control of this weed is addressed in Table 5.10.



Plate 3. African Love Grass (*Eragrostis curvula*) surrounding ESBS remnant B7 (Sept 04)

In September 2003 the NSW Scientific Committee made a final determination to list the 'invasion of native plant communities by exotic perennial grasses' as a key threatening process under the Threatened Species Conservation Act. *Eragrostis curvula* is identified as a grass of special concern in the listing.

At Bonnie Doon this species has also often been referred to as Veldt grass. This common name is usually used, however, for another introduced species, *Ehrharta longiflora*, which also occurs on the golf course and in the local area. It does not form tussocks as in African Love Grass but has a more open habit with wiry stems. It is scattered across the course, particularly in disturbed, sandy patches. *Ehrharta longiflora* is a much less significant problem on the course than *Eragrostis curvula*. Only *Ehrharta longiflora* will be referred to as Veldt grass in this Plan.

Two slightly different forms of *Eragrostis curvula* occur on the golf course, as depicted in Plate 4. The most common form is the one with the lighter coloured seed heads. The one with darker coloured, condensed heads occurs primarily around ESBS remnant B6.



Plate 4. Two slightly different forms of *E. curvula*, shown here adjacent to ESBS remnant B6.

Onion Grass *Romulea rosea* var. *australis*

Onion Grass *Romulea rosea* var. *australis* occurs on the site as a weed of turfed areas where it sometimes dominates the herb-layer. Although this weed is regularly cut as part of turf maintenance it continues to spread across the site. Seeds are easily transported by machinery (e.g. slashers and mowers), human and animal movement, and by runoff (as evidenced in some exposed, re-planted areas downslope of major infestations). A selective herbicide called 'Destiny' has recently become available to control this weed, and is expected to be used on a trial basis by the Club from late 2004 onward.

2.8.4 Eastern Suburbs Banksia Scrub

ESBS is an ecological community only found on nutrient-poor sand deposits in the eastern suburbs of Sydney. It includes an assemblage of over 100 species, and is generally heath or scrub, with occasional areas of woodland or low forest and limited wetter areas (NSW Scientific committee, 1997). At any particular site not all species are likely to be present either above ground or stored as seeds in the soil.

This vegetation type once occupied approximately 5,300 hectares in the eastern suburbs of Sydney and North Head (NSW NPWS, 2003) (Figure 5). Today, only 138 hectares of the ESBS remains as remnants, which range in size from approximately 0.06 to 8.5 hectares (Figure 5), and includes individual (isolated) plants which occur near areas of remnant vegetation. Reflecting its status, in 1997 Eastern Suburbs Banksia Scrub was listed as an Endangered Ecological Community on Part 3 Schedule 1 of the *NSW Threatened Species Conservation Act* (1995). The Final Determination for the Eastern Suburbs Banksia Scrub is given in Appendix 2.

Eastern Suburbs Banksia Scrub is also listed as a Threatened Ecological Community under the *Environment Protection and Biodiversity Conservation Act* 1999 (Commonwealth). Many species occurring within remnants of this community are not listed under the Final Determination; some species are also absent from lists in the draft Recovery Plan, for example *Eucalyptus capitellata* and *Lomandra cylindrica*.

The Recovery Plan for ESBS was published by the NSW NPWS in February 2004.

2.8.1.1 Previous surveys

The ESBS remnants on Bonnie Doon and the adjacent Mutch Park were first surveyed by D. Hirschfeld in May 1997. Hirschfeld recorded a total of 2.5 hectares of ESBS across the two areas, occurring as 17 separate remnants of various sizes and conditions. Fifteen of the 17 remnants were recorded as falling within the bounds of BDGC. Indicative areas of the ESBS on Bonnie Doon & Mutch Park are shown on Figure 6.

Forty-two species of native plants were noted by Hirschfeld across all remnants, including 31 species that are characteristic of ESBS. The number of indigenous plant species in each remnant varied. In only three of the remnants were 20 or more species recorded (B2, B3, & B8). Three of the species identified in the remnants by Hirschfeld are covered by Schedule 13 “Protected Native Plants” of the NPW Act 1974; *Caustis pentandra*, *Eriostemon australasius* and *Actinotus helianthii*. Sections 117 and 118 of the Act list restrictions on the picking, possession and selling of species listed on this Schedule.

Hirschfeld considered the overall condition of the ESBS remnants to be poor. He noted that prior to disturbance the community would have been closed in structure, whereas, now it is usually open. He also noted that weeds had invaded all ESBS remnants on the golf course. The most common weed affecting remnants was found to be *Eragrostis curvula* (African Love Grass) comprising 40-100% cover across remnants. Low densities of other weeds such as Lantana *Lantana camara* and Turkey Rhubarb *Acetosa saggitata* were also found to be present in some of the remnants.

Subsequent flora surveys have been conducted on the site by Bremner (1999), Hirschfeld (1998) and Low and Ondinea (1998). The most recent survey was undertaken by Abel Ecology in 2004. The remnant numbering used throughout this Plan is as used in Hirschfeld (1997).

2.8.1.2 Summary of findings from the 2004 survey

A Baseline Flora and Fauna Condition Report, prepared by Abel Ecology, provides full details of the methodology and results from the 2004 survey. A summary of the results of the 2004 ESBS condition survey is provided here in Table 2.2. Figures 7 and 8 show the location and extent of ESBS remnant vegetation on Bonnie Doon as recorded in the 2004 survey. A flora list for the site is provided in the Flora and Fauna Condition Report.

Class system for condition of remnants

The following class system was used as a basis to describe and assess the ESBS vegetation on-site:

- Class 1** High-quality vegetation (natural/near natural composition and structure); minor weed invasion/soil disturbance.
- Class 2** Reduced native species diversity by comparison to Class 1. Soil disturbance and weed invasion at any/all structural levels; native understorey often replaced by African Love Grass, occasional canopy invasion (e.g. by *Acacia saligna*, other non-local/exotic species).
- Class 2R** – Weeded areas, often planted out to ESBS species. Weed seed germination/minor weed invasion. Includes both recently planted areas on/adjacent to some existing remnants (e.g. B3d, B11b/c).
- Class 3** Native canopy or individual plants of any species occurring within ESBS. Includes, for example, areas of continuous or fragmented canopy cover (*Angophora costata*, as in B7, *Xanthorrhoea resinifera*, as in B8d), and the single clump of the rush *Juncus continuus* just south of canopy margin of B7 near Heffron Road).

Findings

Overall, 15 separate ESBS remnants of varying size and condition were recorded in the 2004 survey. Two of the remnants recorded by Hirschfeld in his 1997 survey (B15 and B16) are actually located within Mutch Park, which is outside of the Club's leasehold. These remnants were not re-assessed in the 2004 survey.

Remnant B17 could not be located in the 2004 survey. Low & Associates & Ordinea (1998) in their work for the Landscape and Environment Plan were also unable to locate this remnant. Similarly all that could be found of remnant B10 was a single *Monotoca elliptica* stump (Plate 5).



**Plate 5. Single *Monotoca elliptica* stump
– all that could be found of ESBS
remnant B10 in the 2004 survey**

Seed sources

High-quality seed sources for many species occur in several remnants on the site, and are indicated in Table 2.2 below (see 'Potential seed source' column). All native species in remnants should be considered for (potential) seed collection where possible and practical. Suggested methods of collection and curation are provided in Appendix 3.

Table 2.2 - Summary of findings from the ESBS Condition Survey 2004

Remnant No.	Class/Condition & Dominant species	Potential Seed Source
B1 complex	C2/C3 – Various dominants: <i>Acacia sophorae</i> , <i>Allocasuarina distyla</i> , <i>Monotoca elliptica</i>	<i>Acacia sophorae</i> <i>Allocasuarina distyla</i>
B2	C1/C2/C3 <i>Acacia sophorae</i> / <i>Angophora costata</i> / <i>Monotoca elliptica</i> / <i>Banksia aemula</i> . Core is C1; W and SE margins are C2 with weed invasion, <i>Acacia saligna</i> trees along SE margin and also with dense weed invasion adjacent to SW corner of remnant; grades into C3 (of <i>Acacia sophorae</i>) on N adjacent to T2 with dense ALG bordering T2 on N, E and W.	<i>Angophora costata</i> <i>Banksia aemula</i> <i>Leptospermum trinervium</i> <i>Monotoca elliptica</i> <i>Acacia sophorae</i> <i>Lepidosperma (viscidum)</i>
B3 complex	C2/C3 – <i>Angophora costata</i> / <i>Monotoca elliptica</i> . C2 with dense ALG understorey; grades into C3 (of <i>Acacia sophorae</i>) on N adjacent to T8 with dense ALG bordering N/NE margin of T8 and covering adjacent slope above G17.	<i>Angophora costata</i> <i>Monotoca elliptica</i> <i>Acacia sophorae</i> <i>Lepidosperma (viscidum)</i>
B4	C2 – <i>Monotoca elliptica</i> . Understorey of mixed natives and dense ALG. Small saplings (to 1.5m) of <i>Melaleuca quinquenervia</i> in shallow drain on East side. ‘Bird sanctuary’ adjoining has various mixed plantings of local/non-local native trees and shrubs.	<i>Acacia suaveolens</i> , <i>Bossia heterophylla</i> , <i>Eriostemon australasius</i> , <i>Xanthorrhoea resinifera</i>
B5	C3 – <i>Xanthorrhoea resinifera</i> 1 shrub each of <i>Acacia suaveolens</i> & <i>A.sophorae</i>	<i>Xanthorrhoea resinifera</i> , <i>A.suaveolens</i>
B6	C3 – Small tree of <i>Monotoca elliptica</i> , 3 shrubs of <i>Banksia paludosa</i> . 2 <i>Persoonia lanceolata</i> seedlings, 1 mature <i>Leptospermum trinervium</i> . Surrounded by ALG. No fruiting follicles were found, and this clump is likely to continue to senescence and die. The planting of local provenance stock nearby should therefore be considered.	<i>Leptospermum trinervium</i> . In heavy fruit during November 2004.
B7	C2/C3 – Canopy of <i>Angophora costata</i> , understorey of ALG, mature plants of <i>Xanthorrhoea resinifera</i> . Mature <i>Banksia</i> on the south end. Clump of <i>Juncus continuus</i> may be lost by dense cover of Kikuyu/ALG unless restored through weed controls.	<i>A.costata</i> , <i>Xanthorrhoea resinifera</i> , <i>Banksia aemula</i> . Single clump of <i>Juncus continuus</i> may be propagated by division.

Remnant No.	Class/Condition & Dominant species	Potential Seed Source
B8 complex	C1/C2 – Scattered/fragmented canopy of <i>Angophora costata</i> , <i>Banksia</i> , <i>Monotoca</i> . Mature <i>Xanthorrhoea resinifera</i> dominates most areas. Dense ALG mixed throughout the understorey. Jacky Dragon habitat. Potential seed source to be used for habitat replacement of ALG.	<i>X. resinifera</i> . Many plants (>200 ?) with scapes, abundant flowering 2004; expected seed source.
B9	C3 – <i>Persoonia lanceolata</i> . Small number of juvenile seed present, mature seed possibly present in soil. Poor seed set expected.	
B10	Only a dead <i>Monotoca elliptica</i> present in the expected location of this remnant	
B11 complex	C1/C2 – <i>Leptospermum laevigatum</i> / <i>Melaleuca armillaris</i> / <i>Monotoca elliptica</i>	Seed source for these species.
B12	C3 – <i>Acacia sophorae</i>	
B13	C3 – <i>Allocasuarina distyla</i>	<i>A. distyla</i>
B14	C2 – <i>Banksia</i> / <i>Leptospermum laevigatum</i> / <i>Xanthorrhoea</i> / <i>Acacia sophorae</i> , ALG throughout the understorey.	<i>Acacia sophorae</i> , <i>Leptospermum laevigatum</i>
B15	<i>Remnant located in Mutch Park – adjacent to BD golf course</i>	
B16	<i>Remnant located in Mutch Park – adjacent to BD golf course</i>	
B17	No remnant plants remain in the expected location of this remnant	
B18	C2/C3 – <i>Acacia sophorae</i> / <i>Persoonia lanceolata</i> & single <i>Acacia sophora</i> . Dense ALG throughout most of the understorey. Small numbers of juvenile fruit on <i>P. lanceolata</i> , low seed set expected. Note: this remnant adjoins a planted area to the west which contains <i>Banksia integrifolia</i> with fungus-affected fruit (possibly <i>Banksiomyces</i> sp.?) – which has the potential to impact areas of planted ESBS.	<i>Acacia sophorae</i>
B19	C3 – Mature <i>Banksia aemula</i> . Very low seed set, <5% of old inflorescences with formed seed follicles.	

2.9 Fauna

The first ever fauna survey was carried out on the site between February and October 2004 by Abel Ecology. A summary of the results of this survey is provided below. Full details can be found in the 'Baseline Flora and Fauna Condition Report', prepared by Abel Ecology, in 2005.

2.9.1 Mammals

Native mammals were not detected on the golf course during the 2004 survey, although insectivorous bats are expected to use the site.

2.9.2 Birds

Native birds detected on the site in the 2004 survey include Superb-blue Wren, New Holland Honeyeater, Nankeen Kestrel, Black-shouldered Kite (Plate 6) and Australian Magpie.



Plate 6. Black-shouldered Kite observed on Bonnie Doon in September 2004

2.9.3 Reptiles

Ten species of native reptiles from the families *Scinkidae* (Skinks), *Agamidae* (dragon lizards) and *Elapidae* (venomous snakes) and *Typhlopidae* (Blind Snakes) were detected during the 2004 survey. They include the Jacky Lizard (or Jacky Dragon) *Amphibolurus muricatus*, which is shown in Plate 7. This lizard is known to feed on beetles, ants and other insects, and near-ground berries and flowers (Ehmann, 1992).



Plate 7. Photograph of Jacky Lizard *Amphibolurus muricatus*, taken near the soil storage bays, northern half of the course (March, 2004)

2.9.4 Frogs

Only one species of frog, *Litoria fallax* was detected during the 2004 survey. The presence of the Red-bellied Black Snake, a frog eater, indicates that other species of frog are likely to occur on the site.

2.9.5 Non-native fauna

Feral animals detected during the 2004 survey include Fox, Rabbit, Common Myna and the introduced rodents House Mouse and Black Rat. Other feral species that are expected to use the site include: feral cats, Red-whiskered Bulbul and the Brown Rat. A Rabbit den was recorded near the third tee and others may occur elsewhere on the site. It is also likely that fox dens occur on the site or in the 6.5 Ha newly leased area, however none were detected during the survey.

Domestic dogs were observed on and near the site during the survey, as local residents appear to use the site to exercise their dogs.

2.10 Habitat

The site harbours small islands of native vegetation in an otherwise developed landscape and similar vegetation characteristics are shared by surrounding areas including The Lakes Golf Course, Mutch Park, Astrolabe Park, David Phillips Sports Field and Eastlakes Golf Course (Abel Ecology, 2005).

Vegetation cover on the course is predominantly maintained turf, and native macro-fauna habitat is effectively restricted to standing vegetation including remnants and planted areas. No drainage lines or water bodies occur on the site (Abel Ecology, 2005).

The site habitat provided by the different types of vegetation occurring across the golf course is described below.

2.10.1 ESBS

The ESBS on the site provides shelter and foraging habitat for animals using the site. Many remnants of ESBS currently contain a dense herb layer (0.2-1.2m high) of the weed African Love Grass *Eragrostis curvula*. This weed is presently used as habitat by Jacky Lizards. Smooth-barked Apple *Angophora costata* dominates a low canopy in some remnants while in others the shrub layer forms canopy composed variously of Mountain Devil *Lambertia formosa*, *Banksia* spp., *Acacia sophorae* and other 2-3m high shrubs. The canopy provides refuge and forage habitat for several native bird species. In a few remnants Grass Trees *Xanthorrhoea resinifera* dominate and during September 2004 broad-scale flowering of this species was attracting insects and native birds to the site (Abel Ecology, 2005).

2.10.2 Areas of open turfgrass

Granivorous and insectivorous birds were observed using the extensive areas of short turf. Masked lapwings also nest in these areas (Abel Ecology, 2005).

2.10.3 Other vegetation

Other plants on the site used as forage by birds include *Callistemon* and *Grevillea* hybrids and species of Pine. The canopy trees that separate most of the fairways provide food for birds and probably the Grey-headed Flying-fox (Abel Ecology, 2005).

2.10.4 Specific habitat features

Specific habitat features that have significance for fauna populations across the site are discussed below. These include both disturbed and natural features.

Shelter sites and diversity	Shelter is provided by ESBS remnants and areas of dense African Love Grass.
Food resources	Are high, including insects, grass seeds, flowers and food scraps.
Nesting/roosting sites and resources	No tree hollows were observed on the site.
Vegetation layers	In open areas: short cut dense turf or long cut turf, with occasional canopy plantings The ESBS: canopy and understorey
Density of cover	Variable. Turfed areas 100%; ESBS 100% in some remnants, to 40% cover in previously weeded areas; fenceline plantings variable, 5% in exposed areas to 90-100% in established areas; Landscaped areas variable.
Clearing	Most of the site has been cleared at some stage in the past (> 97%)
Fire damage and regrowth status	There is no evidence of recent or historical fires.
Vehicle traffic and road mortality	Likely to be high, as the site is bordered by busy roads.
Introduced predators	Foxes, cats and dogs.

3. Management issues

3.1 The Club's Lease with Sydney Water

BDGC holds a 30-year lease with a 20-year option with Sydney Water. Section 12 of the Lease deals with the Environmental Management of the golf course and specifically requires that the Club develop this EMP. There are ongoing requirements that the Club must satisfy in order to meet its lease conditions. These requirements relate to the ongoing implementation of the EMP, the annual review and update of the EMP, the bi-annual audit on the EMP and the carrying out and reporting on monitoring programmes.

3.2 Environmental Legislation, Plans and Codes of Practice

3.2.1 Legislation

Environmental management in NSW and nationally is controlled by many pieces of legislation. Table 3.1 lists some of the main laws that apply to the management of Bonnie Doon Golf Course (as at October 2004). Please note that legislation changes all the time, and it is the responsibility of the Club to keep up to date on and comply with any changes. The Club cannot claim ignorance or lack of knowledge as a defence to avoid prosecution under any of the following Acts. It is therefore extremely important that the Club take a proactive approach or 'due diligence' to understand and implement all relevant legislation.

Table 3.1 - Laws that affect the management of BDGC

COMMONWEALTH LEGISLATION
Environment Protection and Biodiversity Conservation Act 1999 This Act is administered by Environment Australia. Eastern Suburbs Banksia Scrub is listed as a Threatened Ecological Community under the EPBC Act (1999). Under the Act if an action has, will have, or is likely to have a significant impact on ESBS then it will require approval from the Environment Minister. Guidelines are available to assist the Club in determining whether an action should be referred to the Environment Minister. A summary of the guidelines is provided in Appendix 4.
STATE LEGISLATION
NSW Threatened Species Conservation Act 1995 This Act is administered by NPWS (now part of DEC) and provides for the protection of all threatened plants and animals native to NSW and places specific responsibilities on the Club in the areas of environmental planning, and development control. The ESBS is listed as an Endangered Ecological Community under part 3 of schedule 1 of the TSC Act 1995. Implications of this listing include, but are not limited to: ▪ The Club is required to protect ESBS. ▪ A licence is required to carry out <u>any</u> activities within the ESBS, including weeding, seed collection, bush regeneration and ecological burns. Further details on the <i>NSW TSC Act 1995</i> and its implications for the Club are provided in Appendix 5.

National Parks and Wildlife Act 1974

The NPW Act 1974 is administered by NPWS (now part of DEC). It provides protection for all native fauna (except the Dingo) and protected native plants. It is an offence under the Act to harm any protected fauna or do anything with the purpose of harming protected fauna.

Offences and penalties associated with harming, picking or damaging an endangered ecological community or the habitat of an endangered ecological community are also prescribed under the NPW Act. Full details of these offences and penalties are provided in Appendix 6.

Native Vegetation Conservation Act 1997

The NVC Act only applies to land that is zoned as Rural. Most of the Sydney Greater Metropolitan Area is therefore excluded from the operation of the Act including the land occupied by Bonnie Doon Golf Course. As such, the Club is not currently required to comply with the provisions of the NVC Act 1997.

Environmental Planning and Assessment Act 1979

This is the principal Act controlling development in NSW. Any development proposed by the Club needs to be approved under this Act. The consent authority for the Club is the City of Botany Bay Council.

Protection of the Environment Operations Act, 1997

The Protection of the Environment Operations Act (1997) (POEO) is the principal legislation governing pollution in NSW. The EPA, which is now part of DEC, and local government administer this Act. Some of the specific requirements, offences and penalties given under this Act (those that are most relevant to the Club), are provided in Appendix 7.

Under the POEO Act *Control of Burning Regulation (2000)* regulates pollution from fires. The Club must get permission from the DEC to carry out any ecological burns. Further information on the use of such burns on the site is addressed in Section 3.5.1.9 of this Plan.

The Pesticides Act 1999

The NSW Pesticides Act 1999 became fully operational on 1 July 2000. The Act sets out laws regarding the **storage, use and disposal** of pesticides. In particular, it focuses on preventing harm to the environment and to human health by the use of pesticides. The Pesticides Act is administered and enforced by the EPA (now part of DEC).

Specific implications of this Act for the Club include, but are not limited to the following:

- Club staff are required to store, use and dispose of any registered pesticides in accordance with the directions provided on the label (or permit).
- BDGC is also required, under the Act, to keep records on pesticide application. The relevant part of the Act is the Pesticides Amendment (Records) Regulation.
- As of 1 September 2003 there are new rules under the Pesticides Act that mean that any staff who use pesticides as part of their job at BDGC must be trained in how to use those pesticides. This means that Bonnie Doon Golf Club must not employ anyone or instruct a person to use pesticides unless that person is trained. People who are qualified to use pesticides have to be re-assessed every 5 years.

More information on these rules and other requirements of the Pesticides Act are provided in Appendix 8.

Noxious Weeds Act 1983

Part 3 of the Noxious Weeds Act provides that the occupier of land has responsibility for controlling noxious weeds that occur on the land that they occupy. The maximum penalty for not controlling noxious weeds is 40 penalty units (\$4,400). This responsibility can be enforced by the issue of a weed control notice by the Minister or local control authorities.

3.2.2 Plans

There are a number of plans that also affect the way Bonnie Doon Golf Course is to be managed. They include, but are not limited to the plans listed in the Table 3.2.

Table 3.2 - Plans that affect the management of BDGC

NPWS Recovery Plan for the ESBS (March 2004)

The Recovery Plan for the ESBS identifies actions to be taken to ensure the long-term viability of the ESBS in nature and the parties who will carry these out. "The overall objective of the recovery plan is to maintain and enhance existing ESBS remnants and, where possible, expand the ESBS into adjacent areas."

Botany Local Environment Plan 1995 (LEP 1995)

The Botany LEP 1995 was prepared under the EP&A Act 1979. It contains land use and planning controls, and direction and guidance on growth and change within the Botany Local Government Area (LGA).

Development Control Plan(s)

A number of Botany Council DCPs address matters that are relevant to Bonnie Doon Golf Course. They include, but are not limited to:

- Development Control Plan No. 32 – Landscape.
- Draft Development Control Plan No. 40 – Environmental Protection – Wetlands.

DCP's are not legally binding, however their contents are considered in the assessment of development applications.

3.2.3 Codes of Practice

The NSW WorkCover Authority produces industry codes of practice that provide practical guidance and advice on how to achieve the standard required by a number of the Acts and regulations that apply to Bonnie Doon. A code of practice is not law, but it should be followed unless there is an alternative course of action that achieves the same or better standards.

One relevant Code of practice is the *Code of practice for the safe use of pesticides including herbicides in non-agricultural workplaces* published by the NSW WorkCover Authority in 1998. Although published prior to the release of the Pesticides Act 1999 this code still contains relevant guidance on the use, storage and transport of pesticides and herbicides.

3.3 Water use

Golf courses tend to have high water usage requirements. This has two main environmental implications; the use of a scarce resource, and the potential impact that increased levels of runoff can have on downstream water bodies, groundwater and native vegetation.

Bonnie Doon draws all its irrigation water from the Botany Aquifer. It has a 95ML/year licence from DIPNR. Up until the last few years, Bonnie Doon had particularly high water usage. The fairway grass, which was Kikuyu (*Pennisetum clandestinum*), had high water requirements. A substantial build up of thatch had been allowed, making water penetration more difficult. The watering system had also been set up to water substantial areas that were not in play.

Since the arrival of the new Golf Course Manager in 2002 a range of management practices are being introduced to reduce water usage. Fairways have been de-thatched, and are gradually being re surfaced. Kikuyu is being replaced by Couch, a grass that has lower water requirements, on fairways and surrounds. The watering system is being redesigned to reduce the extent of areas not in play being watered. The Superintendent, David Scaife, describes the new approach to watering at Bonnie Doon as *“use the minimum water possible to maintain a healthy sward.”*

At Bonnie Doon watering is carried out in accordance with weather conditions, as turfgrass requires much less water for growth when the weather is cool or cloudy. Most watering is therefore carried out at night time, when atmospheric conditions are cool and calm (between 7.30pm and 4am). Night time is generally less windy, cooler and more humid than the daytime, resulting in less evaporation and a more efficient application of water. The Club have a remote access facility on the watering system, so the irrigation system can be halted at any time if it starts to rain.

Watering times are calculated to prevent surface run off. Split run times are used to maximise water infiltration (3x8 minutes for greens, 2x10 minutes for tees and fairways). The Club carries out deep infrequent watering, rather than shallow watering. This encourages deep root development, reducing water needs and increasing drought tolerance.

Grass thatch is also carefully managed to maximise water infiltration. The supplementary hand watering of greens and dry spots is also carried out to minimise dry patches.

In summer greens are watered every night, and tees and fairways every second night (on average). In winter this drops to two to three times a week for greens, and once every week to fortnight for tees and fairways.

At Bonnie Doon the minimisation of water use must be balanced against site limitations. The soils of Bonnie Doon are pure sand, and have very low water holding capacity. Even if thoroughly irrigated the sands retain only a small amount of plant available water and therefore require frequent irrigation with a small amounts of water. Botany sands also tend to be hydrophobic (water-repellent), and if allowed to fully dry out, they can be very difficult to re-wet. When soils fully dry out, it is sometimes necessary for the Club to use wetting agents to re-wet soils. Wetting agents are surfactants which when added to water or applied to the turf can enhance water infiltration. They are expensive which is the main factor limiting their use at Bonnie Doon.

3.3.1 Records

The Club maintains daily records of weather conditions, rainfall and water used for irrigation. These are summarised into monthly charts of rainfall and water use.

3.4 Water quality

As an area of open space within the Botany Wetlands catchment, Bonnie Doon has the potential to impact both positively and negatively on the water quality of the wetlands. However, due to the position of the wetlands in the catchment and the myriad of pollutant sources throughout the catchment, it is difficult to determine what specific impacts the management practices of Bonnie Doon may be having on the water quality of the wetlands.

The most effective ways that Bonnie Doon can contribute towards improved water quality in the Botany Wetlands are by minimising soil erosion, employing appropriate fertiliser and pesticide handling and application techniques, maintaining vegetative cover across the golf

course and calculating run times to limit the amount of water that runs off the land following irrigation.

3.5 Vegetation management

Vegetation management at Bonnie Doon involves the protection, enhancement and expansion of the remnant ESBS, maintenance of existing planted areas, the planting of additional areas, and the management of weeds and turfgrass.

3.5.1 Eastern Suburbs Banksia Scrub

3.5.1.1 Lease, legislative and Recovery Plan requirements

The lease that BDGC has with Sydney Water requires that the Club produce an EMP that sets out a programme of measures for the protection and enhancement of the natural resources existing on the premises. The Lease also requires that the EMP include “a programme for the protection and rehabilitation of remnant vegetation” (Clause 12.2(d)(2)) and “measures to ensure the protection and recovery of threatened species, populations and ecological communities and their habitat” (Clause 12.2(d)(4)). This Plan of Management describes actions taken to date to protect and enhance the ESBS, actions that are ongoing, as well as additional actions to be taken in the future. Recommended management actions are given in the Action Plan provided in Section 6.0 of this Plan.

Protection of the ESBS is a legal requirement under the TSC Act 1995.

An approved recovery plan is in place for the ESBS in the Sydney Basin Bioregion. The plan identifies actions to be taken to ensure the long-term viability of the ESBS in nature and the parties responsible for carrying them out. “The overall objective of the recovery plan is to maintain and enhance existing ESBS remnants and, where possible, expand the ESBS into adjacent areas.” Sydney Water, as the owner of the land on which the golf course lies, is listed in the Plan as a party responsible for carrying out specific actions relating to the ESBS. As the lessee of land on which the ESBS occurs, Bonnie Doon Golf Club takes on the responsibility of managing the ESBS in a manner that is consistent with the Recovery Plan.

Protection, rehabilitation and expansion of the ESBS on Bonnie Doon is a challenging exercise. All of the ESBS remnants on the golf course are relatively small in size with high edge-to-area ratios making them vulnerable to further degradation. Furthermore, there is only a very limited history of ecological study of the ESBS and empirical evidence from previous attempts at regeneration for the ESBS (Adam, 2001) that can be drawn upon to guide restoration activities. As such, most of what is recommended in this EMP falls under the banner of classical bush regeneration (with some minor modifications to the patterns of work and techniques used). An expected output from the Recovery Plan process is the preparation of Best Management Practice Guidelines for the management of ESBS sites. Some of the techniques given in this EMP, although based upon currently available best practice, may need to be revised once the BMP guidelines are published by DEC. Specific details of the management programme are given in the Action Plan provided in Section 6.0.

3.5.1.2 Threats

Existing and potential threats to the ESBS at Bonnie Doon include:

- Physical damage from mowing, slashing, and/or pruning particularly around the margins of remnants. The exact boundaries of the remnants on the golf course have not been delineated. In addition, remnant margins are often surrounded by very dense stands of African Love Grass (Plate 8) making it even more difficult for staff to know exactly where remnants begin and end. Accidental damage to remnants as a result of maintenance practices is likely to continue until the exact boundaries of the remnants are clearly delineated.



Plate 8. Photo of remnant B7, completely surrounded by African Love Grass (Sept 04)

- Unrestricted access into vegetation remnants. There are few physical barriers to deter or restrict access into or through remnants. In addition, there are few signs or playing rules to deter access. Pedestrian access through remnants not only causes physical damage to mature plants and seedlings but also erosion, and soil compaction which in turn increase susceptibility to weed invasion.
- Invasion by exotic plants. Of particular concern is *Eragrostis curvula* (Plate 8).
- Over-spray from weed or pest control activities near remnants.
- Damage through clearing and development.
- Planting of exotic plants and/or non-locally indigenous species into remnants (Plate 9).
- Mulching in remnants which can lead to the introduction of weed seed.
- Direct grazing, habitat degradation and erosion by rabbits and other non-native fauna.
- Unauthorised seed collection.
- Dumping of grass clippings and other rubbish into or adjacent to remnants (Plate 10).
- Increased nutrient status as a result of accidental application of fertilizers or via stormwater runoff. ESBS is adapted to low nutrient soils. Increased nutrient status can lead to plant damage and also favours the growth of non-natives.
- Altered hydrological regimes (over-watering). The ESBS is adapted to dry soils. Over-watering (either through excess irrigation or due to leakage from pressure release valves) can lead to plant damage and also favours the growth of non-native plants.
- Removal of sand from areas within or immediately adjacent to the ESBS.



Plate 9. Inappropriate planting in ESBS remnant B3d (*Photo courtesy of the NSW National Trust*)



Plate 10. Pile of mulch at the edge of remnant B11b, looking SE toward Eastgardens Shopping Centre

This Plan of Management describes actions taken to date to control or eliminate some of these threats, actions that are ongoing, as well as additional actions to be taken in the future.

The specific issues affecting each remnant are summarised in Table 2.2 and the recommended management actions for each remnant are detailed in the site-specific tables given in Section 6.0 of this Report.

3.5.1.3 Assigning priorities for management of the ESBS

At all times the first priority for the management of the ESBS at Bonnie Doon is it's protection. Specific protective actions are prescribed in the Action Tables given in Sections 5.0 and 6.0 of this Plan. The second priority is restoration. The third priority is expansion.

3.5.1.4 Restoration & Expansion

In the context of this Plan *restoration* refers to the process of reinstating the structure, processes, inter-relationships and dynamics of the indigenous plant community (in this case the ESBS) to the "highest practical extent". It involves the rehabilitation of the community to a more complex, healthy, self-sustaining and biodiverse condition. The main objective being to enhance ecological processes, biodiversity and natural productivity. This definition takes into account the fact that there will be certain site-specific constraints at Bonnie Doon that will limit what is actually practicable in terms of restoration.

On Bonnie Doon Golf Course two different approaches to restoration will be used, sometimes in combination. They are assisted natural regeneration, through bush regeneration practices and reconstruction through re-vegetation.

Assisted natural regeneration refers to the process of restoring the ESBS remnants, in which resilience is depleted, to a healthier condition. It involves the rehabilitation of remnants from a weed infested or otherwise degraded plant community to a healthy community composed of predominantly indigenous species. It relies on natural germination and re-sprouting of plants assisted by weed removal, management of disturbance and the enhancement of natural processes. Research conducted by Clements *et al.* (2001) suggests that ESBS has a high natural resilience to disturbance. Clements *et al.* (2001) found that ESBS naturally regenerated on cleared sand where no vegetation remained above the ground but the soil profile remained intact. This lends support to utilising the in-situ resilience of remnants to the fullest extent practical before applying reconstruction through re-vegetation.

A programme for the restoration of the ESBS on Bonnie Doon commenced several years ago with the development of a Landscape and Environment Plan 1997 - 2007. Many of the restoration actions recommended in the LEP have been carried forward into this Plan. Some actions have not been carried through as they have either been completed or are no longer relevant.

Bush regeneration activities carried out as part of the assisted natural regeneration approach began in remnants B2 & B3 in 2000/01. Actual activities carried out include the following:

- Small Coral Trees and Lantana were cut and painted with a herbicide;
- Asparagus Fern was dug out and the crowns bagged and taken off-site;
- Comprehensive primary weeding of *Eragrostis curvula*;
- Secondary weeding of *Eragrostis curvula*;
- Brush matting, dead branches and non-seeding *E. curvula* was laid down to help limit erosion and to divert run-off (Plate 11) (Rannard, 2001).



Plate 11. Brush matting used for erosion control in ESBS remnant B2. (Photo courtesy of the NSW National Trust)

Initial reports from the bush regenerators responsible for carrying these activities, indicate the re-emergence of a number of indigenous species in treated areas. Indigenous seedlings recorded include *Angophora costata*, *Allocasuarina distyla*, *Monotoca elliptica*, *Pomax umbella* and *Dichelacne crinita*. The clearing of African Love Grass has also exposed other native plants such as *Lepidosperma laterale* (Plate 12) and *Lomandra glauca*.



Plate 12. Here the clearing of African Love Grass has exposed *Lepidosperma laterale* (Photo courtesy of the NSW National Trust)

Some of the ESBS remnants on Bonnie Doon have been degraded to such an extent that bush regeneration activities alone are not likely to facilitate recovery. In these areas reconstruction through re-vegetation is the strategy that is most likely to be used.

Reconstruction through re-vegetation involves the introduction of locally indigenous plant species, modelled on the diversity and structural characteristics of the original plant community (DIPNR, 2003). At Bonnie Doon this strategy is likely to be used:

- to reconstruct areas within the bounds of, or immediately adjacent to the ESBS (that is, in areas where it seems likely that the ESBS occurred in the past); or
- to create the community where it may not have previously occurred (i.e. along fencelines or newly cleared areas).

Reconstruction through re-vegetation will only be used in or immediately around the ESBS when:

- attempts to trigger regeneration of soil stored seed by a range of techniques have failed;
- it has been established that regeneration potential (i.e. from the soil-stored seed bank) has been completely or severely depleted; and/or
- when key species are missing and there is little chance of their natural recruitment into the area (DIPNR, 2003).

In this case, appropriate spacings and mixes of plants will be as determined by the Bush Regeneration supervisor.

The areas away from the ESBS, where reconstruction through re-vegetation is most likely to be used are along fencelines or in areas cleared of turfgrass or inappropriate plants, where there is limited or no soil stored seed and therefore limited or no natural regeneration potential. In this case, appropriate spacings and mixes of plants will be as determined by the Club's horticulturalist.

Reconstruction through re-vegetation has not been carried out, as yet, in any of the ESBS remnants on Bonnie Doon Golf Course. There are two primary reasons for this. Firstly, the restoration program that commenced in 2001 on the Course aims to utilise the in-situ resilience of remnants to the fullest extent practical, before reconstruction through re-vegetation is used. Early reports also indicate that weeding and erosion control works carried out as part of the assisted natural regeneration approach have been enough to trigger some regeneration from the soil-stored seed. As such, reconstruction will not be used unless it these other techniques have failed to produce adequate restoration. Secondly, the restoration programme is staged and is dependent on funding. There are areas of the course and some remnants that are likely to require reconstruction through re-vegetation, but these are planned for the future.

It should be noted that there have been some plantings into remnants, done independently of any direction provided as part of the LEP 1998 and without NPWS approval. An assessment of the appropriateness and possible removal of these plantings is addressed in the site-specific actions Tables given in Section 6.0 of this Plan.

Prioritisation and level of intervention

An assessment of the condition of the remnants and their potential to regenerate naturally (resilience) has been undertaken in order to guide priorities and the level of intervention required for management. This is particularly important at Bonnie Doon as funds and people related resources, are limited.

Low and Ondinea (1998) and Bremner (1999) assessed and rated all of the ESBS remnants on the course in terms of their condition, species diversity and abundance, expected response to treatment and their priority for restoration (Low and Ondinea, 1998; Bremner 1999).

Remnants assigned the highest priority for restoration were: B2, the B3 complex, the B8 complex and the B11 complex. A vegetation condition assessment was carried out again in 2004 as part of the background work required for the preparation of this EMP. Full details of the findings from this assessment are contained in a report by Abel Ecology (2005). Priorities for restoration were found to be consistent with the earlier assessments.

3.5.1.5 Likely benefits of protecting, restoring and expanding the ESBS

There are many benefits that are likely to come from restoring the ESBS on Bonnie Doon Golf Course. The expansion and possible linking of remnants will result in a reduction in area to edge ratio, making them less susceptible to external threats. Restoration will greatly enhance the aesthetic appeal of the course as well as the overall golfing experience. The control of weeds in remnants will also greatly assist efforts to control them in other parts of the course, due to the reduction in seed source. It is also expected that restoration activities will benefit native fauna populations.

3.5.1.6 Licensing Requirements

Past and current legislation require bush regeneration activities within an endangered ecological community to be licensed.

Until January 2003 it was necessary for Bonnie Doon Golf Club to have a section 91 Licence under the TSC Act 1995 in order to carry out bush regeneration activities within the ESBS. A section 91 licence gives permission to harm or pick threatened species, populations or ecological communities or damage their habitat and is issued subject to various conditions. An extract of section 91 of the TSC Act is provided in Appendix 9.

Section 91 Licence Application

In early 2000, Bonnie Doon Golf Club submitted an application for a section 91 licence to carry out bush regeneration activities in its ESBS remnants. It was concluded by the NPWS that the proposed activities would be unlikely to significantly affect the ESBS and would therefore not require a licence. As such, NPWS issued the Club with a section 95(2) Certificate.

The Section 95(2) Certificate

The section 95(2) certificate and associated letter of conditions from the NPWS are given in Appendix 10. The certificate is a defence against prosecution under sections 118A-D of the National Parks and Wildlife Act 1974. An extract of section 118A-D of the NPW Act 1974 is provided in Appendix 6.

The letter of conditions provided with the section 95(2) certificate indicated that the club was only permitted to carry out basic bush regeneration works (such as weeding and erosion control) within the ESBS. The Club was advised that other restoration activities such as re-vegetation or seed collection would require a separate licence or certificate. The expiry date for the certificate section 95(2) is 31st June 2007.

A new licensing provision

In January 2003 a new licensing provision was proclaimed under the Threatened Species Conservation Amendment Act 2002 (TSCA Act, 2002). The new provision authorises the carrying out of actions for scientific, educational or conservation purposes in endangered ecological communities such as the ESBS. (The TSCA Act, 2002 amalgamated some of the licensing provisions previously provided for under the TSC Act, such as section 91, and the NPW Act). It is administered through the provisions of the NPW Act 1974. While the Club already held a section 95(2) licence permitting basic activities, the new provisions meant that it was now possible for the Club to apply for a single licence to carry out these activities plus

additional restoration activities, such as planting and seed collection. Details of the requirements for obtaining a section 132c licence are provided in Appendix 11.

Section 132c Licence Application

In February 2004 Bonnie Doon Golf Club submitted an application for a section 132c licence to the NPWS (now part of DEC). This application was successful and the club was issued with a licence in April 2004. A copy of the actual licence is provided in Appendix 12.

Section 132c Licence Conditions of Approval

The section 132c licence was issued with conditions that must be satisfied by the Club. Some conditions are printed on the actual licence. Other general conditions that the Club must adhere to are contained in the original licence application. When the Club originally applied for the licence they also submitted the NPWS standard 'Bush Regeneration Checklist' with the licence application, to assist the NPWS in assessing the significance of the Club's proposed activities. Because the checklist formed part of the application, the NPWS assumes that the Club is also prepared to adhere to the guidelines contained within the checklist.

3.5.1.7 Sources of plant material

Some of the ESBS remnants on Bonnie Doon have been degraded to such an extent that bush regeneration activities alone are not likely to facilitate recovery. In these areas and other areas of the course nominated for reconstruction through re-vegetation new plants will be required.

To date, the Club has sourced its ESBS species from two local nurseries: Randwick City Council Community Nursery and Rockdale Community Nursery. Rockdale has a licensed seed collector and offers growing, seed collection and propagation services.

Contact details for these nurseries are as follows:

Rockdale Community Nursery
41 Beach Street, Kogarah 2217

Phone: 9553 7346

Fax: 9553 4873

Mobile: 0419 601 853

E-mail: strotter@rockdale.nsw.gov.au

Randwick City Council Community Nursery
2B Barker Street

KINGSFORD NSW 2032

Phone: 02 9399 0933

Facsimile: 02 9662 2658

The Club is required, under its 132c licence to only re-plant into remnants using species that have been propagated using material that has been taken from remnant plants within the site (that is, within the bounds of the current leasehold). For the purposes of this plan and under the 132c licence this also defines the local provenance. The use of site-adapted local material for propagation is considered as the best method for restoring plant communities and conserving the local biodiversity (DIPNR, 2003).

Under the Threatened Species Conservation Act 1995, there is a requirement that seed collected from areas listed as EECs be licenced. As such, it is a requirement that seed only be taken from remnant plants on the course by either a licenced seed collector or by a person covered by the Club's 132c licence.

Remnants containing ESBS species that are a potential seed source are noted in Table 2.2.

Plate 13 shows the prolific flowering, and potential seed source from *Xanthorrhoea resinifera* in remnant B3d in September 2004.



Plate 13. Flower spikes of *Xanthorrhoea resinifera* in remnant B3d (photo taken in September 2004)

3.5.1.8 Weed Management

Weed management associated with the ESBS remnants on Bonnie Doon has the primary aim of freeing up resources such as light, moisture and nutrients for native plant regeneration.

As mentioned earlier weed control activities commenced in Remnants B2 and B3 in February 2000. Specific activities included: targeted weeding of species such as Coral trees *Erythrina x sykesi*, Lantana *Lantana camara*, Asparagus Fern *Protasparagus densiflorus*, Turkey Rhubarb *Acetosa sagittata* and non-indigenous plantings; and comprehensive primary and secondary weeding of African Love Grass *Eragrostis curvula*.

Two control techniques have been used to date. They are removal by hand and the cut and paint technique, which makes use of herbicides. Other methods for applying herbicides, such as by spraying, or by stem injection, may be used in the future if considered appropriate. Herbicides, while valuable aids in weed management, will cause the destruction of native vegetation if they are not applied carefully. Careful application involves:

- Only using those herbicides that are known to be effective on the target species;
- Using herbicides strictly in accordance with manufacturers instructions;
- Timing applications so that maximum effectiveness is achieved (eg taking into account climatic conditions).

To date, all weed control activities in the ESBS have been carried out by the National Trust of Australia. Weed control activities will continue and be expanded upon as part of this Plan. Specific details are contained within the Action Plan given in Section 6 of this Plan.

3.5.1.9 Fire Management

Information on the fire history of the golf course is scant. One or two small fires are thought to have affected the edge of the golf course in recent years. To date, the use of fire in the management of the ESBS on the golf course has not been investigated.

Fire is important to many native plant species as heat, fire or smoke are known to trigger germination. This is well established for a number of the species that occur within the ESBS. However, there is little understanding of the fire ecology of the ESBS at a community level (DEC, 2004). What is known is that high frequency fire and fire exclusion both have the potential to reduce species diversity in ESBS. Field observations indicate that after a prolonged period (>15 years) without fire or similar disturbance, the floristic composition and vegetation structure of ESBS becomes simplified with a few species dominating the standing vegetation (P. Ibbetson, DEC, pers. comm.). The fire ecology of the ESBS community is nominated as a research priority in the ESBS Recovery Plan (2004).

Smoke water treatment is considered a safer option than using actual fire and smoke is the known trigger for some ESBS species. Lesak (2000) examined the influence of smokewater treatment on germination rates *in situ* and in a greenhouse for a range of characteristic ESBS species. While no significant differences were found between treatments for response to smokewater, several species grew in the greenhouse that were not represented as extant vegetation at the site. This is an area for further research and may provide information useful for the restoration of ESBS remnants on Bonnie Doon.

The ESBS Recovery Plan does not indicate which species were actually used in the smokewater treatments. Trials with smoke and/or smoke-water treatments elsewhere have been found to trigger the germination of species in the Epacridaceae family (pers.com M.Sherring), species of which occur in the ESBS at Bonnie Doon. Such species include Tree Broom-heath *Monotoca elliptica*, Beard-heath *Leucopogon ericoides*, Peach Heath *Monotoca scoparia*. Several other species, including West Australian species of Eriostemon (Rutaceae) and Stylidium (Stylidiaceae), are also known to respond to smoke-water treatment and the results of trials are available as web-documents.

There are a number of other issues affecting the use of fire in the management of the ESBS at Bonnie Doon. The Course is located within the Sydney Basin, which is considered a smoke sensitive area. Smoke has the potential to affect local residents, hospitals, retirement villages, schools and air quality. It also has the potential to interfere with flight operations at Sydney Airport and requires communication with the Flight Operations Centre (FOC). The use of fire requires authorized personnel, usually working within the framework of an approved fire management plan that has addressed the sites vulnerability to unplanned fire as well as other suitability factors (DIPNR, 2003)

Fire management within the ESBS at Bonnie Doon is clearly a complex issue requiring careful consideration by the Club.

In planning for an ecological burn it is essential that the Club consult with DEC who have the power to declare no-burn periods. DEC also administers the POEO Act *Control of Burning Regulation* (2000), which regulates pollution from fires.

It is recommended that the Club wait until more is known about the use of fire before it embarks on its use in the management of the ESBS at Boonie Doon. One of the research priorities set out in the ESBS Recovery Plan (DEC, 2004) is further investigation of the fire ecology of the ESBS community.

3.5.1.10 Education and Community Liaison

Under the ESBS Recovery Plan 2004 Randwick, Waverley and Botany Councils are required to distribute an ESBS information leaflet with rate notices. The leaflet is to be prepared by DEC, in consultation with the recovery team, and is expected to highlight ESBS conservation and give details of future bush regeneration activities in which the public may become involved.

To date, Bonnie Doon Golf Club has not undertaken any education or community liaison with regard to the ESBS. As such, a number of recommended actions have been included in the Action Plan developed as part of this EMP. The actions include the compilation of a resource folder on the ESBS, to be made available to staff and players and production of leaflets to inform staff, players and the community of opportunities for participation in bush regeneration activities and information days.

3.5.2 Plantings

The state of plantings as reported in the Bonnie Doon LEP 1998.

In LEP 1998 it was noted that the plantings between fairways and holes were sparse and difficult to maintain (difficult to use ride on machinery). They often included species not suited to site conditions resulting in branch and or cone drop. In many cases plantings had not been designed to provide for the safe movement of players.

The boundary adjacent to Mutch Park was identified as having some views unattractive, others desirable, and security issues due to unrestricted access to the course.

Plantings along fencelines adjacent to roadways were described as being too sparse in places and often comprising inappropriate species resulting in branch and cone drop. The plantings around the Superintendent's house were identified as being difficult to maintain and providing inadequate privacy.

The state of plantings in 2004

Since 2002 the Club has undertaken significant works toward addressing the issues identified in the LEP 1998. These works are ongoing and have been managed by the Golf Course Superintendent David Scaife together with the Clubs former Horticulturalist Ben Marsden (2000 – 2004) and the current Horticulturalist Ben Starr (2004 to present). One of the primary factors currently limiting the removal of inappropriate species such as pines is the requirement by Botany Council that the Club apply for permission to remove each individual tree, and that the Council undertake a site inspection on each occasion. The Club has been working with Council to come up with a way of streamlining this process, whilst still satisfying Council requirements.

3.5.3 Fencelines

Inappropriate species have been removed from fencelines and replaced, in most cases with species characteristic of the ESBS (Plate 14). Logs and branches have also been placed in these areas to enhance habitat values.



Plate 14. Recent fenceline plantings (Area E3) adjacent to the 9th fairway and Banks Avenue (Sept 04)

A list of the plant species used for fenceline plantings between 2002 and 2004 is provided in Appendix 13. Three of the species given on the list in Appendix 13 (*Acacia longifolia*, *Grevillea speciosa* and *Westringia fruticosa*) would be unlikely to occur naturally in the ESBS at Bonnie Doon. Alternative, more suitable species are given in Appendix 14. It is therefore recommended that these species only be used in Landscape plantings from 2004 onwards.

A fence has been installed along the boundary with Mutch Park restricting access to the golf course. All newly planted fenceline areas are routinely maintained.

In some cases the Club has used species in plantings along fencelines that are not characteristic of the ESBS and/or are not suitable for planting on the site (because they have weed potential or are not suited to site conditions). Some of these plants were actually recommended for use in the Plant Schedule contained in the Bonnie Doon Landscape and Environment Plan (1998). They have been removed from the Plant schedule provided as part of this EMP. Some non-ESBS species such as Hoop Pines are unlikely to re-produce on the site and therefore do not require removal or control at this stage. However, there are others that have the potential to cause problems for the Club and their use should therefore be discontinued. Once established, fenceline plantings require regular maintenance including pruning, weeding and mulching.

Table 3.3 provides details of those plants whose use should be discontinued in plantings across the golf course. An asterix “*” has been placed next to those species that were recommended for use in the Plant Schedule contained in the Bonnie Doon Landscape and Environment Plan (1998).

Table 3.3 - Details of those plants whose use should be discontinued in plantings across the golf course

Species	Common Name	Reason(s) for discontinuing use
<i>Casuarina glauca</i> *	Swamp She-oak	This species is likely to have occurred in and around the Botany Wetlands. Although recommended for use in the LEP (1998), the conditions at BD are not suitable for this species. <i>Recommendation:</i> Cease planting on the site.
<i>Melaleuca quinquenervia</i> *	Broad-leaved Paperbark	Although recommended for use in the LEP (1998), this species has weed potential on the site. There is clear evidence of seedlings establishing adjacent to at least one ESBS remnant. <i>Recommendation:</i> There is no need to remove existing plants but control measures may be required whenever this species is located in close proximity to the ESBS (particularly when located close to highly disturbed or regenerating remnants). Cease planting on the site.
<i>Eucalyptus botryoides</i> *	Bangalay	This is not usually found in association with the ESBS. <i>Recommendation:</i> Use <i>E. robusta</i> instead of this species.
<i>Leptospermum continentale juniperinum</i> *	Prickly Tea-tree	Although recommended for use in the LEP (1998), there is actually no suitable habitat on site for this species. <i>Recommendation:</i> Use <i>L. polygalifolium</i> instead of this species.
<i>Pittosporum undulatum</i>	Sweet pittosporum	This species has weed potential on the site. It occurs in several ESBS remnants. <i>Recommendation:</i> Do not use in plantings on the site. Control measures may be required.
<i>Dianella congesta</i> *	Coastal Flax Lily	Although recommended for use in the LEP (1998), this is not actually a locally occurring species. <i>Recommendation:</i> Cease planting on the site.
<i>Schoenoplectus validus</i> *	River Clubrush	Although recommended for use in the LEP (1998), there is actually no suitable habitat on site for this species. <i>Recommendation:</i> Cease planting on the site.

3.5.4 Between Fairways and Holes

Since 2002, the Club has also been gradually removing and replacing inappropriate species between fairways and holes, with a particular emphasis on Pines, Coral Trees and WA Willow Myrtle which pose the greatest safety hazard to staff and players. There are very few Coral Trees (*Erythrina x sykesii*), or WA Willow Myrtle (*Agonis flexuosa*) remaining on the golf course in 2004. The removal of pine trees remains as a significant issue for the Club.

There are several areas of the golf course planted with stands of the Coastal Tea-tree (*Leptospermum laevigatum*). These stands are often very dense and out of scale with paths, can cause over-shading of tees and reduce air-flow around tees. In most cases plants are all the same age and may start dying in the near future.

In recent years the Club has commenced planting out some bunker edges with dense grasses (such as *Poa labillardieri*) and shrubs. An example of this is depicted in Plate 15. These plantings are likely to provide additional habitat for a number of the fauna that inhabit the golf course.



Plate 15. Dense planting of *Poa labillardieri* around the northern edge of one of the bunkers directly behind the 18th green

3.5.5 Landscaping

There are extensive areas of landscape plantings around the golf course. Prominent areas exist around the Clubhouse, the Maintenance shed and the Caretakers Cottage. As with fenceline plantings, since 2002 the Club has undertaken a program of removing inappropriate species from landscaped areas and re-placed them, in most cases with species characteristic of the ESBS. It is necessary for the Club to undertake regular maintenance of these areas including pruning, weeding and mulching. The use of ESBS species in landscaped areas is recommended but not as important as for other planted areas around the golf course. Appendix 14 includes a number of non-ESBS species that can be planted as part of landscape plantings.

3.5.6 Weed Management

Weed management on the course has the aim of freeing up resources such as light, moisture and nutrients for either native plant growth (ie in ESBS remnants and planted areas) or for the growth of turfgrass. Weeds can be removed either by mechanical or chemical means depending on which is the most effective method for the species concerned.

The control of weeds across the golf course will present an ongoing problem in view of the expected soil seed bank. Germination of the seed bank occasioned by bush regeneration or disturbance will require ongoing inspection and weed removal.

The specific issues associated with the management of weeds in: the ESBS are covered in more detail in Section 3.5.1.8; and turfgrass are covered in more detail in Section 3.7.

African Love Grass is a particularly troublesome weed on the course and its management therefore warrants special attention.

3.5.3.1 African Love Grass (*Eragrostis curvula*)

African Love Grass forms dense tussocks and usually occurs as extensive, continuous swards in several areas of the course. Although a highly invasive weed it actually serves a number of

important functions on the course including the provision of a stable cover against soil erosion and habitat for some birds, including quail and seed eating finches and other fauna such as reptiles. These functions need to be taken into account in its management. Overall, African Love Grass is expensive and difficult to remove and control. It will therefore require ongoing management by the Club over many years.

Two forms of this plant occur on the course. The common form is a tussock with numerous slender, bright-green leaves and bears an open panicle inflorescence. The other form, occurring rarely as scattered small stands and groups, has an open, spreading habit of mid-green/blue-green leaves and bears a dark, compact inflorescence. A good example of this can be found adjacent to remnant B6, where both forms occur and the differences are obvious.

Preferred techniques for the treatment of this weed have been provided as part of Guideline No. 3 and Guideline No. 4. Treatments have been designed: to allow enough cover to be retained to protect any planted tube stock; to minimise the impact on resident fauna populations; and to retain roots of the grass, which will help to bind the sandy soils and therefore reduces the potential for soil erosion.

3.6 Fauna management

The first ever fauna survey was carried out on the site between February and October 2004. Prior to this the Club had only a very general awareness of the abundance and diversity of fauna present on the site. The assessment of the nature and extent of fauna populations and current use of the site provides a much greater platform for managing not only the fauna itself but also the other natural resources present on the site, including the ESBS.

Native fauna and their habitats are to be protected, maintained and enhanced under this Plan.

3.6.1 Native Fauna

Native fauna are dependent on native and sometimes exotic vegetation, and other elements in their environment for their survival. In turn, some of these native fauna are likely to play an important role in the pollination and dispersal of native vegetation. This role may be crucial to the long-term regeneration and recovery of the ESBS on the course.

3.6.2 Non-Native Fauna

Non-native fauna observed on the course include rabbits, Common Myna, foxes, feral cats, domestic cats and domestic dogs.

Rabbits, considered one of Australia's most destructive pests, have a variety of impacts on the course, including:

- reducing the regeneration of native plants, by grazing and ringbarking of saplings;
- competing with native animals for food and shelter;
- soil erosion caused by overgrazing and burrowing; and
- providing food for other pest animals, such foxes and feral cats.

Foxes and feral cats prey on a variety of animals including rabbits. While this may help to control the rabbit population on the course they also prey upon medium-sized native mammals and birds and compete with native animals for food and shelter.

The Common Myna, a common feral bird of the Sydney area, uses the site for foraging, shelter and possibly for breeding. In doing so it competes with native birds for food and shelter.

Current Practice for controlling non-native fauna

Bonnie Doon groundstaff are required to report all observations of common non-native fauna to the Golf Course Manager.

The Golf Course Manager engages a suitably qualified contractor to control non-native fauna on an as needs basis. A range of control methods is employed depending on the animal, its population density and its location. The Club also works with neighbouring landholders to conduct control programs, and complement control works on these neighbouring lands.

3.6.3 Habitat for Fauna

The native and non-native vegetation occurring on the course provide habitat for fauna, both native and non-native (feral). As such, the removal of non-native vegetation, whilst an essential part of the vegetation management program provided for in this Plan, must take into account the potential or known value of the vegetation as fauna habitat. This is particularly the case with African *Love Grass*. Whilst a significant weed on the course, African Love grass actually provides habitat for many animals including birds (quail and seed eating finches) and lizards such as the Jacky Lizard. Restoration programs that do not consider the importance of faunal habitat may inadvertently lead to habitat destruction and in turn result in the loss of desired native animals from the site. There are several ESBS species that can be used to provide the similar dense habitat provided by *E. curvula* (e.g. Grass trees, *Lepidosperma* sp.). These species should be used wherever possible across the course to replace habitat that may be lost as part of weed controls.

Plate 16. Examples of Jacky Dragon habitat from around the golf course (Sept 2004)



a. African Love Grass near the main maintenance shed



b. Log on the ground within a remnant

Regard for fauna habitat is also critical to the recovery processes associated with the ESBS. Recovery may be slowed or even stopped in the absence of key fauna that are involved in pollination and/or seed dispersal.

In practice, having regard for fauna habitat may involve staging the removal of weeds, so as to reduce the impact on native animals that may be using it for food and/or shelter. In areas that are to be replanted with ESBS species the aim is to create a diverse vegetation structure that maintains understorey species. Impacts on habitat therefore need to be taken into account whenever any management activity is proposed (such as ESBS restoration, weed control, etc.).



Plate 17. Photo of *Xanthorrhoea resinifera* one of the ESBS species that provides similar dense habitat as *E. curvula*

3.7 Chemical use and storage

3.7.1 The need for Chemical Use

Pests of turf impose economic costs to golf courses in two ways:

1. they can reduce the quality of the playing surface which can reduce patronage;
2. they require inputs of time, money and often chemicals to be kept under control.

The major pests of turf at Bonnie Doon are described in the following sections.

Chemicals may be used at times on the course in response to pests of turf and as part of the broader weed management program. The following sections deal primarily with chemicals and their use in the control of pests of turf. There are special requirements that need to be adhered to when chemicals are used for treating pests that may be affecting the ESBS.

3.7.1.1 Insects

Of the numerous insects residing in golf course turf, very few actually injure the turfgrass. The few that do injure the turfgrass are classified as burrowing and root-feeding or shoot feeding. Several species of larvae feed on turfgrass roots. Others feed on the aerial shoots. Several insects are preferential feeders, which limits the extent of injury to the turfgrass. Others will injure the turfgrass as they feed on stems, roots and leaves. Insects of concern at Bonnie Doon are the burrowing and root-feeding mole cricket and the shoot-feeding Argentine stem weevil (*Listronotus bonariensis*).

The female mole cricket mates and lays her eggs in the soil in spring. Once the eggs hatch the young nymphs tunnel through the soil feeding on the turf root system. It is the tunnelling not the feeding that does the most damage. The tunnelling activity loosens the soil around the root system causing the roots to dry out and moisture stress the turf.

The female Argentine Stem Weevil (*Listronotus bonariensis*) lays her eggs in the grass leaf sheath. From here the tiny maggot-like larvae hatch and tunnel their way into the grass stems until they are too large for the stem diameter. After this stage the larvae will drop out of the

stems and move into the soil/thatch layer to feed on the roots. The stem weevil is a major pest associated with cool season turfgrasses, particularly Bent or Winter Grass (*Poa annua*) greens.

Spiders, worms and ants are generally not considered to be major turfgrass pests at Bonnie Doon.

3.7.1.2 Nematodes

Nematodes are microscopic round worms that reproduce eggs and moult four times prior to becoming an adult. All soils contain nematodes and most are harmless, however a limited number, at some time during their life, parasitize turfgrasses. Plant parasitic nematodes are classified based on their feeding habits and are ectoparasitic or endoparasitic.

Different turfgrasses have different levels of tolerance to parasitic nematodes. Areas of turf damaged as a result of nematodes can appear irregular in shape and will vary in size. Aerial shoots often change from green to light green, to yellow and subsequently to brown. In addition, the turfgrass will appear stunted. Roots will be very short with few, if any, root hairs. Brown or red lesions may be visible at the tips and the root may appear swollen. The turfgrass root systems under attack from these nematodes will be severely weakened and therefore, not able to take up nutrients from the soil.

There have been no problems with nematodes at Bonnie Doon since the current Golf Course manager, David Scaife, joined the Club in 2002. However, historical data indicates that there have been problems with nematodes in the past. Therefore it is important that the golf course be regularly monitored in order to pick up any re-emergence of turf damage due to nematodes.

3.7.1.3 Diseases

Diseases can adversely affect turfgrasses and are generally a result of poor nutrition, soil compaction, extreme temperatures, drought and/or excessive rainfall or watering. In addition, turfgrasses are injured physically by divots, shoe spikes and golf cart tyres. Injury from such physical means often resemble diseases. Most turfgrass diseases are caused from fungal parasites or pathogens. Diseased turfgrasses display bleached leaves, discolored spots or lesions on the leaves and/or depressed circular areas of blighted turfgrass.

Diseases of particular concern at Bonnie Doon are as follows:

- Brown patch (*Rhizoctania solani*) is active in spring and summer and is usually found associated with Bent grass. Its presence may be an indicator of excessive soil moisture, inadequate drainage, or excessive nitrogen and thatch levels;
- Dollar spot (*Sclerotinia homeocarpa*) is a leaf disease and is active in spring and summer. The presence of dollar spot may indicate excessive thatch levels with nitrogen deficient soils. It is usually found associated with Bent grass, Couch or Kikuyu;
- Anthracnose (*Collectotrichum graminicola*) most commonly occurs in summer when turfgrass is experiencing heat or drought stress. When affected, individual leaf blades fade from dark green to light green, to yellow and then they die.
- Fusarium is most active in winter and mainly affects bent grass; and
- Pythium appears as roughly circular, reddish-brown spots or streaks that suddenly appear. In the morning dew, infected grass leaves appear water-soaked, slimy to the touch, and dark green.

The current treatment of diseases on Bonnie Doon is by chemical means.

3.7.1.4 Weeds of turf

Weeds of particular concern to turf at Bonnie Doon are Onion Grass, Summer Grass, Winter Grass and Crows Foot. Onion and Winter Grass are a problem during the cooler months of the year whereas summer grass and crows foot are more of a problem over summer.

3.7.2 Pest Control

In line with good golf course practice, Bonnie Doon uses an Integrated Pest Management (IPM) approach to control pests of turf.

3.7.2.1 Integrated Pest Management

Integrated pest management involves using a variety of management measures to keep turfgrass pest populations below levels that are economically and aesthetically damaging, without creating a hazard to people and the environment (Audubon International, 2002). The basic components of IPM include:

- Employing sound cultural practices to promote turf health;
- Scouting and monitoring potential pest problems and their environment;
- Selecting thresholds for acceptable and unacceptable levels of pest injury;
- Accurately identifying the problem and choosing the best management strategies;
- Educating personnel about various management strategies;
- Proper timing and spot treatment for cultural, biological, or chemical methods;
- Evaluating the results and keeping records.

The following management practices are used at Bonnie Doon as part of their IPM approach:

- Natural biological agents are used wherever feasible.
- Acceptable pest populations are tolerated as long as the desired playing surface is maintained.
- Cultural practices such as fertilising, irrigation and mowing are routinely used.
- Less tolerant turfgrass varieties are replaced with more tolerant varieties.
- Natural predators such as birds and soil inhibiting organisms are promoted. The creation of unmown areas and high mown rough areas assists this strategy.
- Sound knowledge of the life cycle, preferred weather conditions, and other requirements of common pests.
- Close monitoring of pest populations to choose the right time to control.
- Always choosing pesticides that have the lowest known environmental impact.
- Use of both preventative and curative pesticides.
- Scarification. A new scarification method was introduced at Bonnie Doon in 2003. Scarification and aeration are now carried out once a year using a single machine, the 'Koro-recycler'. The recycler has blades which cut into the ground, bringing up sand from beneath the thatch which can then be re-used as a top dressing. Aeration and scarification are extremely important maintenance practices. Although they result in a temporary disruption of the fairways, they help to improve water penetration into the soil, reduce soil compaction, provide for aeration of the soil, stimulate turfgrass root growth which produces a healthier plant, helps control thatch build-up, and improves overall growing conditions. In turn, these processes result in less overall water use.

The ultimate aim of IPM at Bonnie Doon is to maintain a healthy sward of turfgrass that can sustain the wear and tear of golfers.

3.7.3 What is a Pesticide?

A pesticide is any substance or mixture of substances used to destroy, suppress or alter the life cycle of any pest. A pesticide can be a naturally derived or synthetically produced substance. A pesticide can also be an organism. Pesticides include herbicides, fungicides, insecticides, fumigants, bactericides, rodenticides, baits, lures, repellents and pesticides used on animals to control external parasites.

3.7.4 Pesticides Use

Pesticide use at Bonnie Doon has changed since the change in superintendent in 2002. Pests are no longer automatically controlled by chemical means. Instead damage is monitored, cultural practices employed, and preventative and curative pesticides used only when necessary. The severity of the threat posed by the pest has become an important part of the decision making process.

3.7.5 Pesticide Application

Pesticide application at Bonnie Doon is dependent on:

- Careful monitoring of pest populations;
- Accurate identification of the pest;
- Selection of the most effective and environmentally friendly chemical;
- Accurate application of the pesticide.

Trained and qualified operators perform all field applications of pesticides. Liquid pesticides are applied using spray units. All spray equipment is regularly maintained and calibrated with special attention given to pressure hoses and fittings. Failure of these components is the most likely cause of off-target pesticide application. Pre-spray pressure testing is also carried out using water prior to the mixing of pesticides. Granular pesticides are occasionally used and are applied using a rotary spreader.

3.7.6 Record keeping

Appropriate record keeping is an important part of responsible chemical use. There are new requirements for record keeping under the *Pesticides Act* (1999). Keeping comprehensive records is also an important part of integrated pest management.

Bonnie Doon keep both manual and computer records of pesticide use and methods of application. The record keeping sheets used are based on those developed by the NSW Golf Course Superintendents Association, with some small refinements to make them more useful for the Club. These records keeping sheets comply with the Pesticides Amendment (Records) Regulation. The pesticide application record sheet used by staff at Bonnie Doon is provided in Appendix 15. The spray application record sheet used by staff at Bonnie Doon is provided in Appendix 16.

3.7.7 Fertilizer use

The production of a healthy turfgrass sward requires nutrient input from fertilisers (Australian Golf Union, 1998).

Contrary to popular perception, not all golf courses use large amounts of fertilisers. In fact it is widely acknowledged that over fertilization leads to problems with turf grass growth. Until recently Bonnie Doon did use substantial quantities of fertilisers. Under the current management regime fertiliser use has been reduced substantially. The current practice at Bonnie Doon is to fertilise only as required to maintain a healthy sward of turfgrass.

Fertiliser regimes are different for tees, greens, fairways and roughs.

3.7.7.1 Greens and surrounds

Greens require the highest inputs of fertilizer, as the playing surface is regularly mowed and clippings removed to maintain a very low surface that is good for putting. The removal of mowing clippings means that nutrients are constantly being removed from the system, and must therefore be regularly replaced. Typically greens are fertilised 12 to 24 times a year using a liquid foliar application. The liquid fertilizer is applied using spray units that are cleaned and calibrated prior to use.

3.7.7.2 Tees, fairways and roughs

Mower clippings are returned to provide recycled nutrients. Fertilizer is applied to tees to assist divot repair. Typically tees are fertilised once a month in the growing season. Fairways at Bonnie Doon are fertilised once or twice a year. Roughs are generally not fertilised at all.

Fertilisers are only applied in the growing season and where possible, applications are timed to avoid heavy rain. Tees and fairways are usually fertilised using granules which are applied using a rotary spreader.

3.7.7.3 Record keeping

The Club keep comprehensive records for all fertiliser applications. The record keeping sheet used to record fertilizer applications is given in Appendix 17. All fertilizer use is also entered into a database which allows for cumulative totals to be worked out, and for the Superintendent to keep track of total amount of every active constituent applied to the course.

3.7.8 Other chemicals used

Other chemicals used regularly on the course include:

- wetting agents
- root stimulants
- growth retardants/regulators.

Wetting agents are usually used on greens to reduce the impacts of compaction. Products used combine surfactant with kelp extract. The kelp provides biostimulation to the root system. Wetting agents are occasionally used on tees and fairways if the soil has dried out too much and become hydrophobic. Allowing soils to dry out completely is undesirable and therefore golf course practise is to avoid this as much as possible.

Root stimulating hormones, such as auxinone, are applied to greens to produce stronger more efficient root systems. They are applied irregularly, as required.

Growth regulator is used on fairways. Growth regulator reduces mowing and the associated leaf clip to at least half that of untreated turf. This represents significant savings in fuel emissions, machinery wear and tear, and green clip production.

The Club keep accurate records of all other chemicals used on the course.

3.7.9 Chemical Storage Facility

The shed that is currently used for the storage of pesticides at Bonnie Doon is located on the northern side of the golf course. The shed does not currently comply with NSW Workcover requirements. The location of the shed is also inappropriate as it lies on the opposite side of the golf course to the maintenance shed which houses all of the necessary spill containment equipment and showers, etc.

The Club has identified chemical storage, load up of chemicals and washdown of machinery as potential risk areas for contamination. As such, concept plans have been prepared for a new chemical storage, load up area and washdown bay. A Development Application for the new facility is expected to be lodged with Botany Bay Council sometime in the 2004-2005 financial year. The design aims to satisfy Workcover requirements contained within the "Code of practice for the safe use of pesticides including herbicides in non-agricultural workplaces". The new facility will: be located away from other maintenance facilities; incorporate load up and wash down bays; provide separate rooms for fertiliser and pesticide storage, and air hoses to blow machinery down.

3.7.10 Safety and spills

Bonnie Doon does not provide any specific training for staff in the event of a spill nor does it have an emergency procedure in the event of a spill. However, the Golf Course Manager does keep Material Safety Data Sheets (MSDS) for all chemical products used by the Club. The MSDS provide advice on handling, storage and cleanup procedures for liquid chemicals.

Boonie Doon have a Spill Response Kit supplied by Chatoyer Holdings Pty Ltd for dealing with oil and fuel spills only. This equipment is stored in the main maintenance shed.

Three staff at Bonnie Doon are trained and therefore permitted to apply pesticides. A further staff member is expected to have finished the training necessary to apply pesticides by the end of 2004.

3.8 Soil conservation

Soil conservation is important both for the protection of site soil and to prevent further siltation of the nearby Botany Wetlands.

As an established golf course, soil erosion does not present a major problem for the Club. The main way in which the Club actively manages the course to minimise soil erosion is by maintaining a healthy vegetation cover. In situations where vegetation is removed (say for example when remnants are being weeded) the Club employs specific treatments, such as mulching or laying down brush matting to minimise the potential of soil erosion.

3.9 Construction management

Construction activities cause major disturbance, and unless managed carefully, they have the potential to have negative environmental impacts. Damage to vegetation, waste production, soil compaction, soil erosion and dust from construction activities are all potential impacts.

Currently Bonnie Doon use a combination of sediment control fences and watering to reduce soil erosion and dust when carrying out construction works on the course.

The Club is in the process of planning for major construction activities which are likely to commence on the golf course in the next few years.

3.10 Waste management

Waste production at Bonnie Doon consists of:

- General waste from the Clubhouse and maintenance shed;
- Chemical and fertiliser containers;
- Green and organic waste;
- Machinery oil; and
- Hazardous wastes (batteries etc).

General waste from the Clubhouse is put into a 3m³ bin which is emptied twice a week (Plate 18). General waste from the maintenance shed is put into a 3m³ bin that is emptied on an as needs basis (approximately once a month). The Club has a contract with Sita Environment to pick up and dispose of general waste. Paper products are placed into a separate bin (at the Clubhouse and maintenance shed) and are picked up for recycling on an as needs basis (Plate 19).



Plate 18. General waste and recycling bins at the western end of the carpark



Plate 19. Recycling bin for paper and cardboard located, near the Clubs main maintenance shed

Chemical and fertilizer containers are currently disposed of in general waste. Prior to disposal all containers are triple or pressure rinsed and holed pierced with a metal spike to make them unusable. There is a national program for the collection and recycling of chemical containers called drumMUSTER. This program is usually run through local councils. At present, Botany Bay and Randwick City Councils do not participate in this program.

There are licensed hazardous waste contractors who will collect pesticide waste and containers at a cost. The Club uses this service for the collection of old chemicals only.

Most grass clippings are retained on the course. Only clippings from greens are always caught and removed. In peak growth periods clippings from tees are also caught and removed. In general caught clippings are spread in rough areas that are mown. All staff are trained to avoid placing clippings in or near ESBS remnants.

A new scarification method was introduced at Bonnie Doon in 2003 which has substantially reduced green waste generation. Bonnie Doon now use a machine called the 'Koro recycler' for both scarification and aeration of the soil. The recycler has blades which cut into the ground, bringing up sand from beneath the thatch which can then be re-used as a top dressing.

Machinery oil is returned to an oil recycling firm. Hazardous wastes are collected by a licensed hazardous waste contractor, who is engaged on an as needs basis.

3.11 External influences

From time to time there may be activities planned around the golf course, that have the potential to impact either directly or indirectly on the golf course itself. For instance, until recently Sydney Water had plans to construct a recycled water pipeline that was expected to cross the golf course on the lower south-west corner of the northern section, traversing Heffron Road in a north-west /south-east direction. The project was put on hold in mid-2004. Potential impact points were expected to occur at the exit point on Heffron Road and the entrance point on the western boundary. Impact assessment studies carried out by Sydney Water indicated that if recommended precautions were observed there was unlikely to be a significant impact to the ESBS on the course from the pipeline construction.

4. Management Plan

Recommendations for the management of Bonnie Doon are presented in a series of tables. There are two parts to the recommendations, general and site-specific.

General recommendations cover ongoing management issues for the entire course and include ongoing maintenance. Site-specific recommendations cover site-specific issues. To assist in clarity, the course has been divided into three management zones. Each zone has been mapped and site-specific management issues identified and addressed for each zone.

There is a blank column in every table labelled 'comments'. This column has two purposes:

1. The course superintendent can make notes in this column when carrying out any relevant works on the course;
2. When carrying out the annual review of the EMP, comments can be made in this column.

It is intended that this format will minimise the work involved in the annual review and update of the EMP and in the biennial audit of the EMP. This EMP is not meant to be a static document, rather it is a working document that is expected to change in time to improve environmental outcomes.

4.1 Priorities

Priorities have been set as high, medium or low. High priority actions are all the must do sites and actions. These include actions that:

- Have legal obligations;
- Are risk management issues; and
- Affect the way that the course is played.

Medium and low priority actions are those that need to be done, but are less pressing. Many medium and low priorities are aesthetic, or non-essential process actions.

4.2 Timing

The actions in this plan are to be reviewed and updated, as necessary, on each anniversary of the Commencement Date of the EMP, as required under Clause 12.6 of the lease that the Club holds with the Sydney Water Corporation. The timing allocated in the following action plan aims to be realistic about budgets and resources.

5. General recommendations

Table 5.1 - Lease Arrangements

Issues	Priority	Timing	Actions	Comments
5.1.1 Implementation	High	Ongoing	Implement the EMP throughout the term of the lease.	
5.1.2 EMP Review and Update	High	2005 & ongoing	- Review and update the EMP and submit it to the Lessor (SW) on each anniversary of the Commencement Date. - Updates to the EMP approved by SW (written approval received).	
5.1.3 Report on monitoring programmes	High	2005 & ongoing	Submit a report on monitoring programmes carried out during the previous year, to the Lessor (SW) on each anniversary of the Commencement Date.	
5.1.4 Environmental Audit Report – required every second year	High	2006, 2008, 2010...	- Engage a suitably qualified consultant, as approved by SW, who is familiar with the EMP to carry out an audit of the Clubs implementation of the EMP and to review the results of monitoring programmes. - Submit the audit report to SW every two years from the EMP commencement date.	

Table 5.2 - Environmental legislation				
Issues	Priority	Timing	Actions	Comments
5.2.1 Compliance <i>Goal: to comply with all relevant environmental legislation</i>	High	Immediate and ongoing	• Maintain compliance with the Acts listed in Section 3.2 of this EMP. • Maintain records of any incidents that result in non-compliance.	
5.2.2 General Knowledge <i>Goals: to remain up to date with any changes in environmental legislation relevant to the Club; and to assess the Clubs responsibilities under the various Act's; and change management practices accordingly.</i>	High	Immediate and ongoing	• Maintain membership of industry associations (eg Australian Golf Course Superintendents Association). • Maintain subscriptions to main industry magazines. • Subscribe to main government authority web pages, including the DEC (formerly EPA and the NPWS), DIPNR, Environmental Defenders Office, WorkCover NSW. • Golf Course Manager to provide staff briefings on legislation and responsibilities as required.	
5.2.3 Pesticides Act 1999	High	Immediate and ongoing	• Course superintendent to have a copy of the Act (either as hard copy or electronically) that can be easily accessed, as required. • Course superintendent to maintain a Resource folder containing Government produced Fact Sheets on this legislation in order to quickly clarify any issues that may arise with staff. • Maintain compliance with this Act by carrying out the specific actions set out in Table 5.11.	

5.2 Environmental legislation (cont)				
Issues	Priority	Timing	Actions	Comments
5.2.4 Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)	High	Immediate and ongoing	Course management to: • remain informed of the Clubs responsibilities under this Act; • keep all board and greens committee members informed of their responsibilities under this Act.	
5.2.5 Threatened Species Conservation Act 1995 The Club has a responsibility to protect ESBS under this Act	High	Immediate and ongoing	• Course superintendent to keep all staff, board and greens committee members informed of their responsibilities under this Act (Appendix 5 describes some of the legal implications). • Compliance with this Act is also to be maintained by adhering to the general management recommendations provided in Table 5.11 and the site-specific recommendations detailed in Tables 6.1 – 6.3.	
5.2.6 Noxious Weeds Act 1983	High	Immediate and ongoing	• Control all Noxious weeds as declared in the City of Botany Bay. A copy of this list is included in Appendix 18. • Maintain records of any Noxious weeds found, their location and method of treatment. • Liaise with Botany Council whenever Noxious weeds are detected on lands adjacent to the golf course (to help protect the Course from further invasions).	

5.2 Environmental legislation (cont)				
Issues	Priority	Timing	Actions	Comments
5.2.7 Environmental Planning and Assessment Act 1979 Any development on the Bonnie Doon Golf Course is controlled under this Act.	High	As required	Determine whether or not consent is required prior to carrying out any development activities on the site. The consent authority for the Club is the City of Botany Bay Council.	
5.2.8 Protection of the Environment Operations Act 1997	High	As required	Obtain licences in advance for all activities with the potential to cause pollution (as defined under the Act).	
<i>Note: This list is not comprehensive; it only describes the major acts that currently affect the Club. Environmental Legislation is constantly being revised and updated and it is the Club's responsibility to remain up to date with any changes</i>				

Table 5.3 - Water Use and Conservation				
<i>AIM: To ensure adequate water supplies not only for irrigation, but also for the healthy ecological functioning of nearby water bodies, such as the Botany Wetlands and the Botany Sands Aquifer</i>				
Issues	Priority	Timing	Actions	Comments
Goal 1: General Knowledge				
5.3.1 To identify water sources of the golf course and make a commitment to judicious water use	High	Immediate and ongoing	Instruct all employees to conserve water and make water conservation a priority.	
	High	Immediate and ongoing	Train all key maintenance staff to be able to identify the water source used for irrigation (the Botany Sands Aquifer).	

5.3 Water Use and Conservation (cont)				
Issues	Priority	Timing	Actions	Comments
	High	Immediate and ongoing	Golf course superintendent to ensure that irrigation technicians can demonstrate how to correctly operate and manage the irrigation system.	
Goal 2: Water Conservation 5.3.2 Irrigation Equipment and Plumbing Fixtures	High	2005 and ongoing	• Review the design and installation of the irrigation system. Document outcomes. • Test performance of the irrigation system. Document outcomes. • Investigate re-design potential if watering from the irrigation system is found to be inefficient. • Undertake regular checks of the irrigation system to assess performance and delivery efficiency. • Eliminate all non-target watering (e.g. paths, remnants) • Check irrigation equipment daily. • Maintain the irrigation system on a regular basis. • Repair all leaks as soon as they are detected. • Assess pump station performance and efficiency on a regular basis. • Upgrade the irrigation system or components of the system (e.g. valves, nozzles, computer software) to reduce inefficiency and malfunction and reduce water use.	

5.3 Water Use and Conservation (cont)				
Issues	Priority	Timing	Actions	Comments
5.3.3 Irrigation practise	High	Immediate and ongoing	• Irrigate only under calm atmospheric conditions (use climatic data to schedule irrigation). • Calculate watering times to prevent surface run off. • Split watering run times to maximise water infiltration. • Manage grass thatch to maximise water infiltration (See Table 5.5 for further detail on thatch management). • Water deeply and infrequently, rather than shallowly to encourage deep root development, thereby reducing water needs and increasing drought tolerance (if properly watered turf is also more resistant to insects and diseases). • Hand water greens as necessary, to minimise dry patches. • Use wetting agents as required.	
5.3.4 Record keeping <i>Note:</i> water use is likely to change in approximately a ten year cycle, as part of El Nino- La Nina rainfall patterns. Records for water use MUST be compared against records of rainfall to have any meaning.	High	Immediate and ongoing	• Quantify and keep record of daily, monthly and annual water use. • Maintain an accurate record of rainfall. • Compare annual records of water use and rainfall to identify any trends or significant changes in water use. • After recording water use for 3 years, calculate average annual water use and set this as a benchmark for assessing future water use. Aim to have no net increase in water use above this figure.	

Table 5.4 - Water quality				
Issues	Priority	Timing	Actions	Comments
5.4.1 Botany Wetlands and Botany Sands Aquifer	High	Immediate and ongoing	Keep precise records of all activities that have the potential to cause water pollution, so that Clubs activities are clearly identifiable and transparent.	
5.4.2 Potential gross pollutants to nearby waterbodies	High	Immediate and ongoing	Continue to collect rubbish across the golf course as part of weekly maintenance routine.	
5.4.3 Nutrient load from fertilisers	High	Immediate and ongoing	- Maintain minimal fertiliser application - Check records annually to monitor changes.	
5.4.4 Potential contamination from pesticides	High	Immediate and ongoing	Use IPM and follow safety procedures as given in Table 5.5 to minimise the potential for surface or ground water pollution in the event of a spill.	
5.4.5 Soil erosion	High High	Immediate and ongoing As required	- Maintain a healthy vegetation cover. - Install temporary erosion control measures such as hay bales or silt fencing when carrying out any construction work.	
5.4.6 Potential re-development of the 6.5 Ha	High	As required	Investigate potential issues associated with using highly degraded groundwater from beneath this area for irrigation of the 6.5 Ha.	

Table 5.5 - IPM and Chemical Use Reduction and Safety				
**Actions required to comply with the Pesticides Act 1999 and the Pesticides Amendment (Records) Regulation				
Issues	Priority	Timing	Actions	Comments
5.5.1 General Knowledge <i>Goal:</i> To continually expand the Clubs knowledge of Integrated Pest Management (IPM), chemical use issues, best management practices, and alternative pest control measures	High	Immediate and ongoing	- Club superintendent to arrange/provide training for all key maintenance staff in the basic tenets of integrated pest management, including: (1) scouting and monitoring; (2) selecting thresholds; (3) making decisions based on treatment options; (4) proper timing and spot treatment; (5) documenting and evaluating results. - Club superintendent to train all key maintenance staff to recognise that chemical manufacturing, use, storage, and disposal may pose risks to human health and the environment. - Inform staff of the severe penalties that have been established under the Pesticides Act 1999 for the misuse of pesticides. - Club superintendent to train all key maintenance staff to understand that poor management practices may adversely impact on worker health, on- and off-site water quality, local soil health, and fauna species and their habitats.	
5.5.2 Cultural Practices and IPM Techniques <i>Goal:</i> To maintain turfgrass in a vigorous and healthy state	High	Immediate and ongoing	Maintain green, tee and fairway mowing heights at levels that can be reasonably maintained on a day-to-day basis without continually stressing turf or maximising chemical inputs.	

5.5 IPM and Chemical Use Reduction and Safety (cont)				
Issues	Priority	Timing	Actions	Comments
through sound cultural practices and IPM techniques.	High	As required	Carry out turf scarification to control thatch build-up and improve overall turf growing conditions.	
	High	Immediate and ongoing	Continue to replace Kikuyu and Winter Grass with Couch and Bent Grass, respectively, as opportunities arise. Aim for an overall reduction of Kikuyu and Winter Grass by 20% each year. Plant more pest-resistant or stress-tolerant cultivars on playing surfaces.	
	High	2004/05 & ongoing	Designate and train scouts to monitor plant health and pest populations.	
	High	2004/05 & ongoing	Identify and record turf “hotspots” where disease or insect outbreaks routinely occur first. Identify other problem areas where poor growing conditions often lead to problems.	
	High	2004/05	Develop and use scouting forms to record the type; severity; location, and treatment of pest problems.	
	High	2004/05 & ongoing	Establish aesthetic and functional thresholds for insects, fungal diseases and weeds for all managed areas to precisely and efficiently manage pest populations and reduce chemical inputs.	
	High	Immediate and ongoing	Work to change turf stresses, cultural practices, or other conditions to prevent or discourage recurrence of problems.	
5.5.3 Record Keeping	High	Immediate and ongoing	- Keep accurate records of all chemicals used. ** Ensure pesticide records comply with the <i>Pesticides Records (Amendment) Regulation</i>.	

5.5 IPM and Chemical Use Reduction and Safety (cont)				
Issues	Priority	Timing	Actions	Comments
	High	Annually	• Compare total amounts of chemicals used annually to determine trends. • Analyse changes in chemical use to see if other solutions can be developed. (Can increases/ decreases in chemical use be explained?) • Maintain records of the different treatments (chemical and otherwise) employed and their effectiveness. • Use records of treatments employed and their effectiveness to guide pest control decisions.	
5.5.4 Chemical Application	High	Immediate and ongoing	• **Use all chemicals in accordance with the directions provided on the label. • Do not spray in adverse weather conditions- eg when windy or when rain is imminent.	
5.5.5 Pesticide Selection	High	Immediate and ongoing	• Always use the pesticide with the lowest known environmental impact for the situation.	
5.5.6 Chemical store Guidance on design, construction, operation and maintenance of bunds or spill containment systems to minimise the risk of pollution from liquid spills and leaks can be found in a technical manual produced by DEC. This is available at http://www.epa.nsw.gov.au/mao/bundingspill.htm	High	Immediate and ongoing 2005/06	• **Store all chemicals in accordance with the directions provided on the label. • Build new chemical store, washdown bay and load up bay that satisfies WorkCover requirements. • The new facilities must also comply with the storage provisions in the <i>Pesticides Act 1999</i> and must be approved by Council.	

5.5 IPM and Chemical Use Reduction and Safety (cont)				
Issues	Priority	Timing	Actions	Comments
5.5.7 Chemical Disposal	High	As required	**Dispose of chemicals in accordance with the directions provided on the label.	
5.5.8 Equipment	High	Immediate and ongoing	- Check equipment before every use for wear and tear. Replace damaged or old equipment as necessary. - Calibrate equipment every season to identify any problems with nozzles.	
5.5.9 Staff qualifications	High	Immediate and ongoing	**All staff that use pesticides must have the minimum training specified under the <i>Pesticides Act 1999</i>. **Staff qualified to use pesticides are to be re-assessed every 5 years.	
5.5.10 Risk management in the event of a spill	High	2005/06	- Develop a spill management procedure. An example procedure is provided in Appendix 19. - Laminate and display the spill management procedure so that it can be clearly seen in all areas used for the loading up, storage and washing down of chemicals. - Provide regular staff briefings with staff so that they know what to do in the event of a spill. - Put together a folder with all relevant Material Safety Data Sheets for all pesticides used by the Club. - Keep the MSDS folder in an easily accessible location in the case of a spill or other emergency.	

Table 5.6 - Soil management				
Issues	Priority	Timing	Actions	Comments
5.6.1 General erosion control	High	Immediate and ongoing	• Maintain a healthy vegetation cover throughout the lease area. • Identify areas of soil erosion and treat immediately. Treatments may include: – Turfing; – Planting; – Mulching; – Use of geotextile fabrics (e.g. jute matting); – Installation of temporary sediment control devices.	
5.6.2 Erosion control during construction work	High	As required	• Plan construction work to expose the least amount of soil possible, and to be as quick as possible. • Install erosion control measures while working, such as hay bales or silt fences. • Ensure that there is a adequate cover over soil at the completion of works.	
5.6.3 Soil Types	Medium	2005/06	• Develop and maintain an inventory of all soil types for all playing surfaces and assess conditions such as soil structure, nutrient levels, organic content, compaction, and water infiltration.	
5.6.4 Soil Maintenance	High	Immediate and ongoing	• Carry out regular work to improve soil health. This may include: amending organic content, aerating, and improving water infiltration. Aim to cultivate a diverse, living biotic soil community (i.e. encourage soil micro-organisms). This will also help to reduce the need for pest treatments.	

Table 5.7 - Construction management				
Issues	Priority	Timing	Actions	Comments
5.7.1 Approvals	High	As required	• Submit a development application that seeks the consent of Council for planned construction works such as, building or, landscaping, and the use of signage. The determining authority for the Club is the City of Botany Bay Council. • Consult with the Sydney Water Corporation prior to the commencement of any major construction works.	
5.7.2 Soil erosion	High	As required	• Incorporate the aim to minimise soil erosion into all plans for construction. (Minimisation of soil erosion can be satisfied by following the actions in Table 5.6).	
5.7.3 Dust control	High	As required	• Manage all construction activities in such a way as to minimise dust.	
5.7.4 Noise control	High	As required	• Manage noise particularly from large truck and plant movements during construction activities.	
5.7.5 Waste control	High	As required	• Investigate the potential for recycling waste products generated during the building process.	
5.7.6 Tree protection	High	As required	• Use tree protection measures whenever construction works have the potential to impact on trees on the golf course. General tree protection measures are contained in Appendix 20.	

5.7 Construction management (cont)				
Issues	Priority	Timing	Actions	Comments
5.7.7 Protection of the ESBS	High	As required	• Install protective fencing, at least 1m from the outer edge of the remnant, around any ESBS remnant within 100 m of construction works. • The fencing must include an effective silt barrier to protect the remnant from eroded sediments or runoff during construction. • Protective fencing is to be maintained in working order for the duration of building or development works.	
5.7.8 Potential re-development of the 6.5 Ha	High	As required	• Ensure re-development is consistent with the management actions and principles of this EMP.	

Table 5.8 - Waste management				
Issues	Priority	Timing	Actions	Comments
5.8.1 Pesticide and fertiliser containers	Medium	2005/06	- Investigate return of chemical containers (with the NSWGCSA); - Lobby local Councils to become part of the drumMuster program.	
5.8.2 Green waste	Medium	2005/06 Ongoing	- Build compost bins as part of the upgrade of the maintenance sheds. - Retain grass clippings on the course wherever possible. Grass clippings must not be placed in ESBS remnants under any circumstances. (Disposing of grass clippings into EBBS remnants will damage the ESBS and make the Club liable to prosecution under the Threatened Species Act 1999).	
5.8.3 Waste from the Clubhouse & Maintenance sheds	High	Ongoing	- Maintain current contacts for the disposal of waste from the Clubhouse and maintenance sheds. - Periodically check bins to ensure collection frequency is adequate. Adjust collection frequency as required.	
5.8.4 Recycling	High	Ongoing	- Educate staff about the importance of recycling as responsible land managers. - Maintain paper recycling contract for paper coming from both the Clubhouse and Maintenance sheds. - Check with Botany Bay City Council about any additional recycling services available in the area.	
5.8.5 Machinery Oil	High	Ongoing	Continue to recycle machinery oil.	

5.8 Waste management (cont)				
Issues	Priority	Timing	Actions	Comments
5.8.6 Record keeping/monitoring	High	Ongoing	• Keep a record of the quantity of waste generated by the Club on an annual basis. This can be done by recording the number of Otto bins and skips used. • Compare the quantity of waste generated each year. Investigate any increase of over 10% from one year to another.	

Table 5.9 - Vegetation Management - Plantings				
<i>Site-specific recommendations are given in Section 6 of this Plan</i>				
Issues	Priority	Timing	Actions	Comments
5.9.1 Pines (<i>Pinus radiata</i>): - Many trees are dying as a result of the hailstorms of 1999. Dead and dying trees pose a safety risk to players and staff. - Trees are too large, roots get into play areas and cause mowing issues. - Trees are costly to remove. - Pines are providing food and habitat for yellow tailed black cockatoos and other birds. - Approval from Botany Council is required to remove these trees. This is a particularly onerous requirement for the Club given the large number of pine trees that remain on the golf course.	High	Ongoing	- Follow the actions provided in the site-specific actions tables in Section 6 of this Plan. - Gradually replace pines with tree species from the plant schedule given in Appendix 14.	
5.9.2 Tea tree (<i>Leptospermum laevigatum</i>): - Are often too dense and out of scale with paths. - Can cause over-shading of tees and reduce air flow around tees. - Plants are all the same age and may start dying in the near future.	Medium	Ongoing	- Follow the actions provided in the site-specific actions tables in Section 6 of this Plan. - Underprune tea trees to improve air-flow and highlight sculptural trunks. - Wherever holes arise in dense clumps of Tea trees, plant out with other trees from the plant schedule given in Appendix 14.	

5.9 Vegetation Management - Plantings (cont)				
Issue	Priority	Timing	Actions	Comments
5.9.3 Landscape Plantings	High	2004 & Ongoing	- Implement the actions recommended in the site-specific actions tables given in Section 6 of this Plan. - Wherever possible use ESBS species in landscape plantings across the golf course. These and some non-ESBS species that can be used in landscape plantings are listed in Appendix 14.	
5.9.4 Fenceline plantings There are some inappropriate species planted along fencelines. In some areas of the course fencelines still require planting out.	High	2004 & Ongoing	- Implement the actions recommended in the site-specific actions tables given in Section 6 of this Plan. - For all future plantings along fencelines only use species identified in the recommended plant schedule given in Appendix 14.	
5.9.5 Plantings between fairways and holes	High	2004 & Ongoing	- Implement the actions recommended in the site-specific actions tables given in Section 6 of this Plan. - Species best suited for planting between fairways and holes are listed in Appendix 14.	
	Medium	2005 & Ongoing	Wherever possible (in places where it does not interfere with course playability) plant out of at least one edge of each of the course bunkers with <i>Poa labillardieri</i> or dense shrubs such as <i>Xanthorrhoea resinifera</i>. (Further details on the habitat benefits of these plantings are provided in Table 5.12).	

5.9 Vegetation Management - Plantings (cont)				
	Issue	Priority	Timing	Actions
5.9.6	Plantings between tees and fairways (areas of 'carry')	High Medium	2004 & Ongoing 2005 & Ongoing	- Implement the actions recommended in the site-specific actions tables given in Section 6 of this Plan. - Wherever possible (in places where it does not interfere with course playability) plant out of areas of 'carry' with ESBS species. Use <i>Poa labillardieri</i> as a border to protect ESBS plantings from trampling and damage.
5.9.7	Habitat Considerations	High	2004 & Ongoing	- Whenever possible consider the habitat potential of an area when carrying out additional plantings or routine maintenance (weeding, pruning or mulching). - Follow the recommendations in Table 5.13 'Fauna', regarding the use of new plantings to provide areas of habitat, especially for small birds and reptiles.
				Comments

Table 5.10 - Vegetation management - Weeds

Site-specific recommendations are given in Section 6 of this Plan				
Issues	Priority	Timing	Actions	Comments
5.10.1 African Love Grass (<i>Eragrostis curvula</i>) • Covers extensive areas of the course. • Provides a stable cover against soil erosion and soil-moisture loss. • Is expensive and difficult to remove. • Provides habitat for native and some non-native fauna. Native birds, include quail and seed eating finches and reptiles include the Jackie Dragon. • If controlled all over the course these areas will need to be planted out with alternative species. This is likely to be expensive and otherwise waste resources. • Instead, site-specific strategies should be used depending on the area, extent, whether in shade or full sun, and proximity to/within ESBS.	Medium	Ongoing	• Treat areas of <i>Eragrostis curvula</i> within ESBS remnants as directed in Table 5.10 and in the site-specific actions tables provided in Section 6 of this Plan. • Do not make any further plantings of <i>Eragrostis curvula</i>. • When renovating a hole or planting an area out, remove <i>E. curvula</i> and replace with a suitable native grass, groundcover or ESBS shrub species from the plant schedule provided in Appendix 14. • Whenever possible, remove <i>E. curvula</i> outside of times of when it is providing a major food source for birds. (The proposed strategies for control of <i>E.curvula</i> have been tailored to reduce labour & time costs while being consistent with regeneration objectives on the course).	

5.10 Vegetation management – Weeds Continued				
Issues	Priority	Timing	Actions	Comments
5.10.2 Onion Weed (<i>Romulea rosea</i>) This small perennial herb occurs over large areas of the golf course, particularly in planted areas and other non-play areas. Infestations can be very difficult to control, due in part to its large reproductive capacity. Flowers occur each spring. A capsule containing many small oval seeds is produced soon after flowering, and as seeds mature, the capsule angles down to the soil surface. Eventually the capsule dries and splits open, releasing the seeds. Soil disturbance and movement is the main form of dispersal, both of seed and corms. Water may also transport seeds small distances. <i>R. rosea</i> can be dug out. This is very time-consuming and needs to be done using a technique that ensures the removal of the underground corm and any cormlets. Cormlets left behind can resprout. Treatment must be continued for several years to ensure that all remaining seeds and cormlets have been removed. <i>R. rosea</i> can also be treated by spraying with the herbicide Iodosulfuron-methyl sodium (Destiny) which allows for the selective control of Onion weed and Rye Grass. The Club started to use this product in mid 2004, with successful results.	Medium	Ongoing	- In short-term, maintain current area and extent of <i>R. rosea</i> invasion by regular slashing particularly prior to seed-set. - Continue to control using the herbicide Iodosulfuron-methyl sodium (Destiny).	

5.10 Vegetation management – Weeds Continued				
Issues	Priority	Timing	Actions	Comments
5.10.3 Noxious weeds	High	Ongoing	- Remove or control all Noxious weeds. Noxious weeds declared for the City of Botany Bay are listed in Appendix 18. - Where the weed is providing habitat for native fauna (such as Lantana providing habitat for bush birds) it may be appropriate to leave weeds until appropriate natives are planted and established, in order to provide alternate habitat.	Noxious weeds on the site include: <i>Cestrum parqui</i> Green Cestrum W2 <i>Lantana camara</i> Lantana W2 <i>Ricinus communis</i> Castor Oil Plant W2 <i>Parietaria judaica</i> Wall Pellitory W3 <i>Opuntia</i> sp. (<i>O.stricta</i>) Cactus W4f
5.10.4 Other environmental weeds	High	Ongoing	- Control environmental weeds as identified in the site-specific actions tables in Section 6 of this Plan. - Control all other environmental weeds, particularly where they may have an impact on remnant vegetation.	
5.10.5 Weeds of turf	High	Ongoing	Continue to manage turfgrass weeds using an IPM approach.	

Table 5.11 - Vegetation management – Protection of the ESBS				
Issues	Priority	Timing	Actions	Comments
<i>The Clubs first priority must be to protect the existing ESBS.</i>				
5.11.1 Legislation The Club has responsibilities under state and federal legislation to protect the ESBS.	High	Ongoing	- Protect the ESBS by maintaining compliance with relevant Acts. - Provide regular staff briefings (at least every six-months) on the Club's responsibilities under the EPBC Act and the TSC Act with respect to the ESBS. Staff includes all board and greens committee members.	
5.11.2 The Club is required to manage the ESBS in a manner that is consistent with the Approved Recovery Plan (DEC, 2004).	High	Ongoing	The actions proposed as part of this EMP have been designed to be consistent with the overall aims and objectives of the Approved Recovery Plan.	
5.11.3 Identification of remnants	High	2004/05	Mark out the boundaries of all ESBS remnants using the procedure provided in Guideline No. 5.	

5.11 Vegetation management – Protection of the ESBS (cont)				
Issues	Priority	Timing	Actions	Comments
5.11.4 Provision of adequate signage  Plate 20. Example of a sign currently placed at the edge of ESBS remnant B7 (Sept 04)	High	2004/05	- Club to place a sign along at least one edge of all remnants to advise players and staff that access to remnants is limited to maintenance and rehabilitation work only. The intent of the signs is to inform players and remind staff that cart or pedestrian access into remnants is prohibited. - Some of these signs are to state the fact that the ESBS is an Endangered Ecological Community; and indicate that there are penalties associated with causing harm to the ESBS under the NPW Act. (Specific offences and penalties are listed in Appendix 6).	
5.11.5 Restricting access to remnants	High	As required	Where signs are being ignored and/or carts, machinery or pedestrian access into remnants is damaging the ESBS: - String rope or wire between remnant identification pegs to prevent access. - Develop local rules that make it unnecessary for players to enter remnants to retrieve balls. Options include defining these areas as “ground under repair” or “out of bounds”. - Golf Course Manager needs to regularly remind all maintenance staff of the importance of keeping maintenance practices outside of the remnants.	

5.11 Vegetation management – Protection of the ESBS (cont)				
Issues	Priority	Timing	Actions	Comments
5.11.6 Reduction and elimination of degrading disturbances	High	2004 & ongoing	• Inform all staff of the legal ramifications of causing damage to the ESBS, under the TSC Act 1995. • Withdraw mowing and associated maintenance practices from remnants. • Where necessary carry out feral animal eradication. • Control erosion in remnants using logs, branches or brush matting. • Carry out weed management as described below. All weed management associated with the ESBS is to be undertaken by a suitably qualified and experienced Bush regenerator or under their direct supervision.	

Table 5.12 - Vegetation management – Enhancing the ESBS				
Actions to Enhance the ESBS				
The second priority for the Club, in terms of the management of the ESBS (after protection), is to enhance the ESBS through bush regeneration. This will involve the following:				
Issues	Priority	Timing	Actions	Comments
5.12.1 Provision of funding	High	2004 & ongoing	Club to allocate a minimum of \$10,000 per year, for the next 5-10 years, toward on-the-ground bush regeneration activities.	
5.12.2 Licensing a. The Club requires a licence to carry out bush regeneration activities within or that will affect the ESBS. At present actions for research, education or conservation purposes involving an EEC such as the ESBS can be licensed under section 132C of the NSW National Parks and Wildlife Act 1974.	High	2004 & ongoing	Apply for and then maintain the currency of a 132c licence that will allow bush regeneration activities to be carried out within the ESBS on BDGC.	
b. The Club was issued with its first 132C Scientific Licence on the 30th of April 2004. The licence was issued with conditions that must be satisfied by the Club. Some conditions are printed on the actual licence. The licence is also subject to the general conditions contained in the original licence application.	High	Ongoing	Key conditions printed on the actual licence that must be satisfied by the Club include: - No replanting within 20m of a known locality of a threatened species. - No seed collection of species listed under the NSW TSC Act 1995. - Bush Regeneration activities to be undertaken by a suitably qualified and experienced persons or under their direct supervision.	

5.12 Vegetation management – Enhancing the ESBS (cont)				
Issues	Priority	Timing	Actions	Comments
	High	Ongoing	Key conditions contained in the original licence application that must be satisfied by the Club include: • The NPW Act 1974 and regulations thereunder shall be strictly observed and complied with. • As far as possible carry out collections or research away from the view of the public. • Carry the licence at all times while work is being undertaken in the field. • Only allow the person(s) named on the licence or authorised under the terms and conditions of the licence, to undertake the actual work. The licence is not transferable. • Inform NPWS of any significant changes in personnel associated with the 132C licence. • Submit a full report, which gives details of the actual work carried out under the licence, to the NPWS within two months of the expiry date of the licence. (It is recommended that BDGC amend the existing arrangement that they have with the National Trust so that the Bush Regeneration Contractor is required to submit a report on the actual work carried out under the licence at least three months prior to the expiry date of the licence. This will allow sufficient time for the Club to submit the report to NPWS within two months of the expiry date of the licence).	
	High	Ongoing		
	High	Ongoing		
	High	Ongoing		

5.12 Vegetation management – Enhancing the ESBS (cont)				
Issues	Priority	Timing	Actions	Comments
c. When the Club originally applied for the licence they also submitted the NPWS standard 'Bush Regeneration Checklist' with the licence application, to assist the NPWS in assessing the significance of the proposed activity. Because the checklist formed part of the application, the NPWS assumes that the Club is also prepared to adhere to the guidelines contained within in the checklist.	High	Ongoing	<i>Failure to submit a full report to the NPWS will delay or prevent the renewal of the licence and may incur an infringement notice for a breach of licence conditions (\$300).</i> Some of the key guidelines in the checklist that the Club is expected to adhere to are: • <i>Training & Supervision</i> ~ That all workers carrying out bush regeneration and associated works on the site be supervised by a trained (e.g. someone with a Certificate of Bushland Regeneration) or experienced (a minimum of 2 years bush regeneration experience) co-ordinator. ~ That all activities by workers be regularly checked and approved by the bush regeneration coordinator. ~ That all workers have adequate weed and native plant identification skills that are appropriate to the site. • Other guidelines from the checklist have been included under the 'Weed Management', 'Herbicide Use' & 'Reconstruction through revegetation' sections given below. They are clearly identified as such in each section.	
	High	Ongoing		

5.12 Vegetation management – Enhancing the ESBS (cont)				
Issues	Priority	Timing	Actions	Comments
d. Other licence-related requirements	High	Ongoing	• Develop a section 132c licence register for keeping track of all persons working under the section 132c licence. • Require all parties who will be carrying out work under the licence to read and accept the 132c licence conditions and sign the register before commencement of work. This will help to ensure that each person working under the licence is well aware of the licence terms and conditions. • Club Management to provide regular staff briefings on the 132c licence and associated conditions. Ensure that the conditions issued with the licence are understood and adhered to by all staff working in or around the remnant vegetation as well as board and committee members. This includes the conditions actually printed on the licence plus those contained with the original licence application and the NPWS Bush Regeneration Checklist.	
5.12.3 Weed Management a. Some ESBS remnants contain Noxious and/or environmental weeds. Statutory requirements for Noxious weeds are contained in the Noxious Weed Act (1993). Further details are provided Appendix 18.	High	As required	• Remove all Noxious and environmental weeds as recommended by the bush regeneration coordinator and in accordance with best practice techniques (given below).	

5.12 Vegetation management – Enhancing the ESBS (cont)				
Issues	Priority	Timing	Actions	Comments
b. NPWS Bush Regeneration Checklist. The Club is expected to adhere to the guidelines provided in the NPWS checklist as part of its 132c licence.	High	Ongoing	- Undertake weed removal within 2m of remnant plants by hand. - Positively identify all plants before they are removed (pulled, cut, poisoned etc). - Sharpen and clean secateurs before use with methylated spirits. - Clean footwear of loose soil and when possible treat with bleach between sites to reduce the possibility of introducing plant diseases or weed propagules.	
c. Additional guidelines - have been included here to address other specific issues that are relevant at Bonnie Doon.	High	Ongoing	- Use Herbicides only as prescribed in Section 5.12.4. - Weed control not within 2m of remnant plants can be by manual removal, using the cut and paint method or by spraying. - Carry out primary and secondary weeding of <i>Eragrostis curvula</i> by hand and in a mosaic pattern with patches no greater than 3m² to: reduce the impact on any fauna that may be using the grass as habitat; and to reduce the risk of erosion.	 Plate 21. This photo shows the clearing of ALG in small patches to minimise erosion and habitat disturbance.
	High	As required	Where weed control exposes bare sandy soils use brush matting, logs and/or branches to limit erosion and/or divert flows, particularly in steeply sloping areas.	

5.12 Vegetation management – Enhancing the ESBS (cont)				
Issues	Priority	Timing	Actions	Comments
	High	Ongoing	- Base the rate of weed removal on an assessment of the response of the remnant in terms of natural regeneration and weed regrowth rates. The assessment is to be carried out by the Bush Regeneration Coordinator. - Modify rates of removal if the results of monitoring programs indicate a significant impact on resident native fauna.	
5.12.4 Herbicide Use a. General guidelines	High	2004 & Ongoing	Avoid herbicide use in remnants as far as possible. The judicious application of herbicide is only permitted when considered absolutely necessary by the Bush Regeneration Coordinator and only in accordance with best practice techniques.	
	High	2004 & Ongoing	Develop a specialised tool for spraying herbicides which prevents spray drift, that can be used when spraying in close proximity to remnants.	
	High	2004 & Ongoing	Maintain a buffer, the size of which is to be determined by the bush regeneration coordinator, around all remnant plants. Only use herbicides outside of this buffer.	

5.12 Vegetation management – Enhancing the ESBS (cont)				
Issues	Priority	Timing	Actions	Comments
	High	2004 & Ongoing	- Prohibit the large scale spraying of herbicides within remnants. - Only permit spot-spraying of herbicides or use of the cut and paint technique within ESBS remnants: - when deemed absolutely necessary by the Bush Regeneration Coordinator; - in small patches and after a thorough check of the area immediately surrounding the area to be treated has ruled out the presence of regenerating native seedlings.	
b. NPWS Bush Regeneration Checklist. The Club is expected to adhere to the guidelines provided in the checklist as part of its 132c licence.	High	Immediate & Ongoing	- Allow spot-spraying of herbicides within ESBS remnants only: - in suitable weather conditions (dry & still); - when applied by an operator capable of undertaking precise spraying; - Mix white marker dye with herbicides before use, to enable the user to see where the spray is landing. - Direct all weed spray away from remnant plants. - Cease herbicide use where there are any signs of remnant plants being affected (eg browning off, wilting).	

5.12 Vegetation management – Enhancing the ESBS (cont)				
Issues	Priority	Timing	Actions	Comments
5.12.5 Potential impact of bush regeneration activities on fauna and faunal habitat. Several of the guidelines contained within the NPWS Checklist for Bush Regeneration Activities in the habitat of an EEC, concern fauna. The Club is expected to adhere to these guidelines as part of its 132c licence.	High	Immediate & Ongoing	- Consider the habitat potential of weeds and rubbish prior to their removal. - Where weed invasion is extensive, remove weeds gradually, leaving enough weeds to provide habitat until the native plant species have established and provide alternative habitat. - Avoid disturbance to, and the removal of rocks, logs and other potential refuge sites.	
5.12.6 Reconstruction through re-vegetation <i>The in-situ resilience of remnants is to be utilized to the fullest extent practicable before applying reconstruction through re-vegetation.</i> a. Planning	High	2004 & ongoing	Planning – must be undertaken by the bush regeneration coordinator in order to identify: - the ideal or preferred range of species to be used. The coordinator may liaise with the Club horticulturalist and/or a qualified Botanist as required, on species selection for each remnant; - the methods and techniques for propagule introduction; - the pattern and sequence of re-vegetation; and - what site preparation and maintenance will be required.	
b. Storage of propagated material	Medium	2005/06	Club to construct a dedicated propagation shed on-site for use by the Club Horticulturalist.	

5.12 Vegetation management – Enhancing the ESBS (cont)				
Issues	Priority	Timing	Actions	Comments
c. Bush Regeneration Checklist. A number of the guidelines provided in the NPWS checklist cover aspects of the re-vegetation process. The Club is expected to adhere to these guidelines as part of its 132c licence.	High	Ongoing	- Collect suitable local provenance seed and/or take cuttings and arrange for the commencement of propagation at least two years before the actual plants are required. - Source all plantings from stock of local provenance (in this case from within the bounds of the golf course). - Limit seed collection from any one species must to less than 10% of the available crop at the site. - Limit seed collection from any individual plant must to less than 10% of the available crop. - Take care to ensure that weeds and/or phytophthora are not introduced to the site from pots of cultivated plants. - Maintain a protective buffer, the size of which is to be determined by the Bush Regeneration Coordinator, around all remnant plants. Planting is only to be undertaken outside this buffer. This is to help protect the roots of remnant plants from damage of the introduction of disease.	
	High	Ongoing		
	High	Ongoing		
	High	Ongoing		
	High	Ongoing		
	High	Ongoing		
d. Record Keeping	High	Ongoing	Maintain records of any local provenance seed collected and/ or cuttings taken, including the date and location.	

5.12 Vegetation management – Enhancing the ESBS (cont)				
Issues	Priority	Timing	Actions	Comments
5.12.7 In the Recovery Plan DEC is responsible for developing Best Practice Management Guidelines for the management of ESBS sites.	High	As required	If required, update the techniques prescribed in this EMP once DEC BPM guidelines become available.	
5.12.8 Identification of expanded areas	High	As required	Mark out the area to be expanded using the method described in ‘Identification of remnants’ provided above.	
	High	As required	If this area is likely to be impacted by pedestrian access, machinery or golf carts string rope or wire between the remnant identification pegs to completely prevent access.	
	High	As required	Erect a sign indicating that it is a regeneration area for an EEC and note that there are penalties associated with causing harm to the ESBS under the TSC Act.	
5.12.9 Monitoring	High	As required	Engage a suitably qualified contractor to monitor and report on the impact of management practices (e.g. bush regeneration) on the ESBS.	
a. The Club is required under its Lease with Sydney Water to carry out regular monitoring of the management practices adopted and the environmental state of the premises.		Ongoing	Establish and maintain a photographic record of all works carried out within the ESBS.	
b. The Club is also required to provide a report on the results on monitoring carried out during the previous year, (to be submitted together with the annual review and update of this EMP).	High	Annually	Submit an annual report on the results of monitoring to Sydney Water. (Report is to be submitted on the anniversary of the Commencement Date of the EMP).	

5.12 Vegetation management – Enhancing the ESBS (cont)				
Issues	Priority	Timing	Actions	Comments
5.12.10 Altered Hydrological Regime	High	Ongoing	- Check the irrigation and storm/waste water systems regularly for leaks, damage etc that may be affecting the amount of water entering remnants. - Fix leaks, replace old equipment as soon as possible to limit potential impact on remnants. - If excess water is found to be entering any remnant(s) the water must be re-directed away from remnant(s) and the source of the problem fixed before restoration work commences or continues.	
5.12.11 Fire Management	Medium	2005/06	- Club horticulturalist to research the potential for using smoke water treatments for triggering germination in the ESBS remnants. - Liaise with the NPWS (now part of the DEC) on the potential use of fire in the management of the ESBS at Bonnie Doon. - Prior to carrying out an 'ecological burn': - Obtain any permits required under the POEO Control of Burning Regulation 2000. - Contact at least the following organisations; - Sydney Water; - Flight Operations Centre for Sydney Airport; - Botany Bay Council; - Rural Fire Service.	
	Medium	As required		
	Medium	As required		
	Medium	As required		

5.12 Vegetation management – Enhancing the ESBS (cont)				
Issues	Priority	Timing	Actions	Comments
5.12.12 Education	High	2005/06	• Make contact with local Bushcare/Landcare groups. • Produce an information flyer that provides an overview of the ESBS, including its location, significance and management.	
	High	2005/06	• Distribute the flyer to all Club members, local Bushcare groups and local residents.	
	Medium	2006/07	• Investigate the possibility of involving interested members of the Club or local community in restoration activities. (Tina Rigby of Randwick Council may be able provide assistance and names of potential volunteers).	
	Medium	2006/07	• Liaise with NPWS over the legal/licensing issues associated with this. • Investigate what insurances may be required for volunteers working on the site. • Add an information page(s) on the ESBS to the Club's website.	

Table 5.13 - Fauna Management				
Issues	Priority	Timing	Actions	Comments
5.13.1 NATIVE FAUNA				
5.13.1.1 Fauna Protection All native fauna (except the Dingo) are protected under the NPW Act 1979. It is an offence under the Act to harm any protected fauna or do anything with the purpose of harming protected fauna.	High	Ongoing	• Ensure the protection of any native fauna that occur on the golf course. • Always take into consideration the potential impacts of herbicides and/or insecticides on any non-target fauna.	
	High	Ongoing	• All management actions to be implemented on the golf course need to take account of the existence and needs of existing fauna populations. • Follow actions prescribed in Table 5.11 and Table 5.12 for the protection and enhancement of the ESBS. Protection and enhancement of the ESBS will be an important means by which the Club can also ensure the protection and enhancement of key fauna habitat.	
5.13.1.2 Habitat Protection				
	High	Ongoing		

5.13 Fauna Management (cont)				
Issues	Priority	Timing	Actions	Comments
	High	Ongoing	• When carrying out clearing in any area of the course (including weedy areas) check first to determine whether the area is being used as habitat for birds or other native animals such as lizards. • Create fauna refugia as part of weed control activities. Fauna refugia are typically small undisturbed areas within or near disturbed areas that provide shelter and food resources for a small population of animals. When disturbance occurs animal populations contract into these refugia and as the disturbance dissipates populations expand into nearby areas. Refugia on BDCG will play an important role while disturbances such as weed control occur. It is recommended that weed control be staggered to allow for undisturbed areas act as refugia. • Always re-plant using appropriate habitat replacement species (see Appendix 14).	
	High	Ongoing		

5.13 Fauna Management (cont)				
Issues	Priority	Timing	Actions	Comments
5.13.1.2 a. Habitat potential & replacement Weeds such as <i>E. curvula</i> provide habitat for a number of key fauna that live on the golf course including the Jackie Dragon. The program for controlling and in some locations eliminating African Love Grass will also result in a loss of habitat for these species. It will therefore be necessary to undertake a program that aims to not only provide alternate habitat for these species but that also provide for the gradual replacement of any lost habitat.	High	Ongoing	- Consideration is to be given to the habitat potential of areas such as: - Weeds - Rubbish/debris (old pipes, tiles, sheets of tin), prior to their removal. - This is particularly important where these areas have been long established and/or are away from public view (such as the 6.5 hectare land parcel; and areas of African Love Grass). - Work is to be carried out toward replacing these areas with more suitable plant species prior to their removal to allow time for fauna to relocate to the alternate habitat sites. - Consideration is also to be given to maximising the habitat potential of regenerated areas.	
5.13.1.2 b. Habitat Creation	High	Ongoing	When planting out new areas of the golf course consideration should be given to the habitat requirements of resident fauna.	
	High	As required	- Specific actions include: - Always use ESBS plant species from the plant schedule given in Appendix 14.	

5.13 Fauna Management (cont)				
Issues	Priority	Timing	Actions	Comments
	High	As required	- Wherever possible retain or re-introduce logs, bark, dead brush/natural debris etc into planted areas and ESBS remnants. - Logs from felled trees should be kept on the site and placed either within ESBS remnants or in the corridors between ESBS remnants to improve connectivity between these areas.	
	High	As required	- Concentrate on areas adjacent to existing habitat as they are they have the highest potential to provide quality habitat and allow for easy dispersal of fauna. - Wherever possible include species in plantings that are known to attract pollinators (such as <i>Lambertia formosa</i>, Banksias and Acacias).	
	Medium	As required	Wherever possible (in places where it does not interfere with course playability) plant out of at least one edge of each of the course bunkers with dense grasses and shrubs (<i>Poa labillardieri</i>, <i>Xanthorrhoea resinifera</i>) to provide alternative and/or additional habitat for fauna.	

5.13 Fauna Management (cont)				
Issues	Priority	Timing	Actions	Comments
	Medium	As required	- Wherever possible (in places where it does not interfere with course playability) plant out the area beneath course tees with dense grasses and shrubs (<i>Poa labillardieri</i>, <i>Xanthorrhoea resinifera</i>) to: - provide alternative and/or additional habitat for fauna; - connect areas of existing vegetation. This should also assist in the safe movement of fauna around the golf course. - Concentrate on those areas where the plantings will connect existing vegetation.	
c. Monitoring is required as a condition of the lease that the Club has with SW	High	As required	Club to engage a suitably qualified contractor to monitor and report on the impact of management practices (eg. bush regeneration, plantings) on fauna and fauna habitat.	
d. Reporting – required as a condition of the lease that the Club has with SW	High	As required	Submit an annual report on the results of monitoring carried out during the previous year, (to be submitted together with the annual review and update of this EMP) to Sydney Water. (Report is to be submitted on the anniversary of the Commencement Date of the EMP).	
e. Record Keeping	High	Ongoing	Keep a list of all native fauna (including birds) sited on the course. As a minimum record the: - Animals name; - Date observed; and - Location/Habitat.	

5.13 Fauna Management (cont)				
Issues	Priority	Timing	Actions	Comments
f. Education	Medium	Ongoing	• Invite a specialist from Birds Australia or the Cumberland Bird Observers Club to run a guided walk around the course each year.	
	High	2004/05	• Buy 2 copies of an accessible bird field guide, such as Simpson <i>et.al.</i>, 1996 <i>Field Guide to the birds of Australia</i>. Place one copy in the greenkeepers' lunch room, the other in an easily accessible location in the Clubhouse.	
	Medium	2005/06	• Order or arrange development of posters showing the most common fauna likely to be encountered across the golf course. Place them in the Green keepers lunch room to help raise awareness amongst staff and assist in identification.	

5.13 Fauna Management (cont)						
Issues		Priority	Timing	Actions	Comments	
5.13.2 FERAL ANIMALS						
a. Record Keeping & Control		High	Ongoing	• Maintenance staff to report sightings of feral animals to the Golf Course Manager. • Golf Course Manager is to monitor and keep records of the numbers and locations of feral animals. • Golf Course Manager is to engage suitably qualified contractor(s) for feral animal control, as required. • The Club is to work with surrounding land managers, listed below, to coordinate control of feral animals, in particular foxes and rabbits: ○ The Lakes Golf Course; ○ Eastlakes Golf Course; ○ City of Botany Bay Council; ○ University of NSW; ○ RTA; and ○ Sydney Water.		
		High	As required			
		High	As required			

Table 5.14 - Education and Outreach

The purpose of education and outreach is to ensure ongoing support for stewardship initiatives, strengthen local community connections and extend participation in environmental conservation activities.

Issues	Priority	Timing	Actions	Comments
5.14.1 General Knowledge				
Goal - To improve our ability to communicate our commitment to environmental stewardship and implement conservation activities.	Medium	2005-07	Form a Resource Advisory Group to help plan and implement environmental projects and educational efforts on the golf course. For guidance on carrying out this action refer to “<i>A guide to environmental stewardship on the golf course</i>” Audubon International 2nd Edition.	
	Medium	2005-07	Nominate at least one member of the Resource Advisory Group to take primary responsibility for communicating the Clubs environmental goals, objectives, and projects to club members and the wider community.	
	Medium	2005-07	Contact at least one member of the local community or one community organisation (not affiliated with the golf course) to participate in project planning or implementation. This person may provide advice, assist with projects or monitoring, or provide technical support.	
	Medium	2005-07	Develop written materials highlighting the natural resources that occur on the course, the environmental management of the course and opportunities for participation (e.g. brochures, articles that could be submitted to local papers, posters).	

5.14 Education and Outreach (cont)				
Issues	Priority	Timing	Actions	Comments
5.14.2 Education Goal - <i>To educate staff, Club members, decision makers and community members about programs and projects on the golf course which improve environmental quality.</i>				
a. Staff qualifications	Medium	Ongoing	• Annually review staff qualifications. • Discuss the importance of ongoing training and education with staff. • Encourage staff to identify and pursue training to improve their education and skills, particularly in bush regeneration. • Consider hiring a staff member with bush regeneration qualifications and experience. If a suitably qualified person is employed, apply for an amendment to the Clubs 132C licence, to list that person on the licence (This will provide the Club with greater freedom to carry out bush regeneration activities).	
b. Keeping up to date with industry	Medium	Ongoing	• Golf Course Superintendent and any other relevant staff to attend relevant industry seminars etc to keep abreast of latest developments in golf course management and as a means for sharing the management experience gained at Bonnie Doon.	
	Medium	Ongoing	• Maintain a list the industry seminars attended each year. • Superintendent to encourage relevant staff to keep up to date with developments in the industry. • Maintain subscriptions to industry journals.	

5.14 Education and Outreach (cont)					
Issues	Priority	Timing	Actions	Comments	
			• Provide maintenance staff with access to industry journals and other educational material. • Investigate other mechanisms for staying up to date with developments within the industry (eg internet discussion groups, mail lists from the DEC, DIPNR etc).		
c. Dissemination of information amongst staff	Medium	Ongoing	• Encourage a culture of discussion and inquiry amongst staff. This can be done through: informal conversations and formal meetings. • Staff who have attended industry seminars are to report back to fellow staff on what they have learnt. (Sending staff to seminars will be of most value to the Club if relevant information is passed on to the rest of the work force.)		
d. Environmental education for staff	Medium	2006/07	• Send a member of the maintenance staff to TAFE (or equivalent) to study an environmental management course.		

5.14 Education and Outreach (cont)				
Issues	Priority	Timing	Actions	Comments
e. Member education	High	2006 & Ongoing	• Make written materials available to club members. • Establish a bulletin board or some type of display in the Clubhouse that provides information on the environmental management of the golf course. • Place articles in the Club newsletter to keep members informed of the environmental issues affecting the Club (i.e. the ESBS, fauna) and how members can be involved (through such things as bush regeneration activities and bird observations days). • Organise for signs to be made up that highlight key habitats or projects to members and guests. Signs should be placed at strategic locations around the course.	
f. Community Education	Medium	2006/07 & Ongoing	• Add page(s) to the Clubs website detailing the natural resources that occur on the course, the environmental management of the course and opportunities for participation. • Submit educational articles for publication in local newspapers. • Distribute information brochures to neighbouring home/property owners. • Send information brochures to key community contacts.	

5.14 Education and Outreach (cont)				
Issues	Priority	Timing	Actions	Comments
5.14.3 Outreach <i>Goal - To provide opportunities for members, staff, decision makers, and the community to be involved in environmental projects on the golf course.</i>				
	High	2006/07	• Invite employees, club members and community members to be involved in the Resource Advisory Group. • Prepare a list of organisations, agencies and others from the community that might be interested in knowing about or getting involved in environmental projects on the golf course. • Organise specific activities that provide for employee, club member and community participation. Activities may include bush regeneration, fauna/bird observation days and flora and fauna field trips for local school(s). • Invite interested employees, club members, and community members to be involved in these specific activities.	

6. Site-specific Management Recommendations

The following sets of recommendations relate to specific locations on Bonnie Doon. The course has been divided into 3 zones, based on proximity and geographic features.

Table 6.1 - Zone A Management Recommendations				
This table is to be read in conjunction with Figure 10				
No.	Issues	Priority	Timing	Actions
6.1.1 ESBS REMNANTS - The Club has a legal requirement to protect and enhance the ESBS on the golf course				
B3	ESBS Remnant (B3) Complex (Depicted on Figure 10 as B3a – B3f)	High	2004 & ongoing	Mark out the extent of the remnant using the technique described and depicted in Guideline No. 5.
		High	2004 & ongoing	- Continue bush regeneration activities (which aim to protect and enhance the ESBS) as per ESBS Guideline No 2. - Bush Regeneration Coordinator to assess and if required remove inappropriate plantings. - Treat <i>Romulea rosea</i> adjacent to this remnant with the 'Destiny' herbicide.
				Herbicides are only to be used adjacent to remnant ESBS in accordance with the general guidelines provided in Table 5.12.4.

6.1 Zone A Management Recommendations – ESBS remnants (cont)					
No.	Issues	Priority	Timing	Actions	Comments
B4	ESBS Remnant (B4) There are <i>Melaleuca quinquenervia</i> seedlings invading the margin of this remnant along a short drainage line. These plants have apparently been able to establish from previous high-moisture content in the soil provided by the nearby tap. There will be a seed source in this area but it is unlikely to establish successfully in the absence of sufficient moisture – similarly to all other areas where this species has been planted. Small number of Lantana plants also here; these would be easily removed.	High	2004/05	Mark out the extent of the remnant using the technique described and depicted in Guideline No. 5.	
		Medium	2006/07	Commence bush regeneration activities (which aim to protect and enhance the ESBS) as per ESBS Guideline No 2	
B5	ESBS Remnant (B5) <i>E. curvula</i> has been slashed right up to the margins of ESBS plants. There is a large pine tree on the margin.	High	2004/05	Mark out the extent of the remnant using the technique described and depicted in Guideline No. 5.	
		Medium	2006/07	Commence bush regeneration activities (which aim to protect and enhance the ESBS) as per ESBS Guideline No 2.	

6.1 Zone A Management Recommendations – ESBS remnants (cont)					
No.	Issues	Priority	Timing	Actions	Comments
B6	ESBS Remnant (B6) Presently choked by dense ALG. No fruiting follicles were found in 2004, this clump is likely to continue to senescence and die. 2 forms of ALG occur here.  Plate 22. Photo of <i>Banksia paludosa</i> within remnant B6.	High	2004/05	- Mark out the extent of the remnant using the technique described and depicted in Guideline No. 5. - Plant local provenance stock nearby - may aid in survival of this remnant.	
		Low	2008/09	Commence bush regeneration activities (which aim to protect and enhance the ESBS) as per ESBS Guideline No 2.	

6.1 Zone A Management Recommendations – ESBS remnants (cont)					
No.	Issues	Priority	Timing	Actions	Comments
6.1.2 PLANTINGS					
P4	Unsuitable species planted between 8 th and 18 th fairways.	Med	2007/08	- Continue gradual removal of WA Willow Myrtle (<i>Agonis flexuosa</i>) and Pine Trees (<i>Pinus</i> sp.). - Grind stumps if necessary. - Chip and stockpile as mulch for future planting sites, ensuring that all mulched material is free of seeds and weeds. - Prepare for planting, plant and maintain as per Guideline No. 6.	
P5	Unsuitable species planted between 18 th and 9 th fairways	Med	2007/08	- Continue gradual removal of Pine Trees (<i>Pinus</i> sp.). - Grind stumps if necessary. - Chip and stockpile as mulch for future planting sites, ensuring that all mulched material is free of seeds and weeds. - Prepare for planting, plant and maintain as per Guideline No. 6.	
P6	Unsuitable species planted between 6 th and 7 th fairways. Need to reinforce plantings with suitable species.	Med	2007/08	- Continue gradual removal of Pine Trees (<i>Pinus</i> sp.). - Grind stumps if necessary. - Chip and stockpile as mulch for future planting sites, ensuring that all mulched material is seed & weed free. - Prepare for planting, plant and maintain as per Guideline No. 6.	

6.1 Zone A Management Recommendations - plantings (cont)					
No.	Issues	Priority	Timing	Actions	Comments
P6a	Bird Sanctuary – A variety of weeds have invaded this area. Part of this area has been used as a sand mine, leaving a shallow open gully. There is also an area of dense <i>E. curvula</i> at the top edge of the mined area. There is a track that runs through this area that starting to erode.	Low	2008/09	- Control invasive weeds. - Rehabilitate the area used for sand mining by re-grading and re-planting with species from the recommended planting list (Appendix 14). - Control <i>E. curvula</i> by slashing and spraying with an appropriate herbicide. <i>E. curvula</i> will require ongoing control. - Maintain a layer of fine brush matting (mulch) over the access track. Club to consider upgrading the track surface at some stage in the future.	
P7	Unsuitable plantings between the 7 th and 17 th fairways. Need to reinforce plantings with suitable species.	High	2005	- Remove <i>Corymbia citriodora</i> Lemon-scented Gum, - weed in Sydney area. - Chip and stockpile as mulch for future planting sites, ensuring that all mulched material is weed free. - Establish an area of 'carry' between the 7th tee and the fairway. Plant this area out with ESBS species. If possible, plant <i>Poa labillardieri</i> around the ESBS plantings, to help protect the plantings from damage and trampling. - Prepare for planting, plant and maintain as per Guideline No. 6.	

6.1 Zone A Management Recommendations - plantings (cont)					
No.	Issues	Priority	Timing	Actions	Comments
P8	Unsuitable species planted between 17 th and 10 th fairways. Need to reinforce with suitable species.	Low	2008/09	- Remove WA Willow Myrtle (<i>Agonis flexuosa</i>) from the southern end of P8 and Pine Trees (<i>Pinus</i> sp.). - Chip and stockpile as mulch for future planting sites, ensuring that all mulched material is seed & weed free. - Prepare for planting (include <i>Melaleuca armillaris</i>, <i>Leptospermum laevigatum</i>, <i>Monotoca elliptica</i>, <i>Banksia aemula</i> in the species selected for this area), plant and maintain as per Guideline No. 7.	
P8a	Two newly cleared & planted areas below the 9th green. Exposed soils are being invaded by <i>Romulea rosea</i>. New plantings require regular maintenance.  Plate 23. Photo showing one of the newly cleared and planted area's, with an area of dense <i>Romulea rosea</i> in the foreground (Sept 2004)	High	2005 & Ongoing	- Remove <i>Romulea rosea</i> by hand, using a suitable hand tool or trial use of 'Destiny' herbicide. - Plant a dense strip of <i>Poa labillardieri</i> along the top edge of this area to help stabilise soils and to control the further downslope spread of <i>Romulea rosea</i>. - Maintain the planted area as per Guideline No. 7.	

6.1 Zone A Management Recommendations (cont)					
6.1.3 EDGE PLANTINGS					
No.	Issues	Priority	Timing	Actions	Comments
E2a	Eastern half of boundary to UNSW David Phillips sportsfield. Silky Oak <i>Grevillea robusta</i> has significant weed potential. Several large trees will require ongoing pruning. Disturbance in the vicinity of these trees may germinate seeds of this species, which will need removal. Climbers will eventually need replacement over time, particularly <i>Kennedia rubicunda</i> & <i>Hardenbergia violacea</i> as these become straggly and loose their foliage over time.	Low	Ongoing	- Carry out regular pruning of Water Gum <i>Tristanopsis laurina</i> and 2x Swamp Mahogany <i>Eucalyptus robusta</i>. Club to consider replacing 2x Swamp Mahogany as they will outgrow the area where they are currently planted. - Remove Silky Oak <i>Grevillea robusta</i> and replace with a suitable shrub from recommended planting schedule given in Appendix 14. - Replace climbers when they become straggly and loose their foliage.	 Plate 24. Photograph of fenceline plantings (E2a) looking NE (Sept 2004).
E3	Some of the plants used to plant out the fenceline that runs adjacent to Banks Avenue (north of remnant B6) are non-ESBS species (Eg Spotted Gum, Tallowood, Bunya and Hoop Pines). They should be considered for removal and replacement while they are still young.	Medium	2006/07	- Club to consult with a suitably qualified consultant to accurately identify non-ESBS species, if required. - Club to consider removal of Spotted Gums <i>Eucalyptus maculata</i>, Tallowood <i>Eucalyptus microcorys</i> Bunya and Hoop Pines and any other non-ESBS species planted along the fenceline. Once removed these trees should be replaced with ESBS species (Appendix 14). It should be noted that removal of these species while they are saplings is far easier than removal once they reach maturity. - Grind stumps if necessary.	

6.1 Zone A Management Recommendations – edge plantings (cont)					
No.	Issues	Priority	Timing	Actions	Comments
				• Chip and stockpile as mulch for future planting sites, ensuring that all mulched material is weed free. • Prepare for planting, plant and maintain as per Guideline No. 7.	
	African <i>Love Grass</i> and other weeds are re-sprouting in planted areas.	High	Ongoing	• Spray African Love Grass and other weeds with an appropriate herbicide. • Maintain at least a 1 metre buffer from ESBS plantings or spray using ESBS protective device.	
	Fenceline plantings require regular maintenance.	High	Ongoing	• Maintain the area in a weed-free condition. • Prune vegetation as required. • Replace mulch if necessary.	
	Some <i>Monotoca elliptica</i> seedlings have established within the planted area (source unknown). Stakes have been placed adjacent to them to clearly identify them.	High	Ongoing	• Maintain at least a 1 metre buffer from the <i>Monotoca</i> seedlings when spraying weeds in this area. • Restrict access to planted areas by maintaining “No Carts, No Buggies” signs at regular intervals along the fairway side of this area.	 Plate 25. Photo of the <i>Monotoca</i> seedling that have come up in area E3 (Sept 04).

6.1 Zone A Management Recommendations – edge plantings (cont)					
No.	Issues	Priority	Timing	Actions	Comments
	ESBS remnant B6 is located toward the southern end of E3.	High	Ongoing	Additional care is to be taken when carrying out any activities that could result in harm or damage to this ESBS remnant.	
E4a	Unsuitable plantings and some undesirable views of Heffron Road. It is expected that undesirable views will reduce as the fenceline plantings mature.	High	2005/06	Remove Passionfruit vine <i>Passiflora edulis</i>.	
		Low	2008/09	- Consider removal of other non-ESBS species. Wherever possible replace with ESBS species (see the recommended planting schedule given in Appendix 14). - If current plantings do not provide adequate screening in time, augment plantings to improve screening. Only use species from the recommended planting schedule provided in Appendix 14.	

6.1 Zone A Management Recommendations – edge plantings (cont)					
No.	Issues	Priority	Timing	Actions	Comments
E4b	Behind the 7 th tee the non-local native <i>Grevillea</i> (possibly <i>G. "Sandra Gordon"</i>) has been planted. Pollinators (birds, insects) attracted by this plant are also likely to pollinate nearby ESBS species.	Medium	2006/07	Reinforce the area immediately around the <i>Grevillea</i> with ESBS species such as <i>Lambertia formosa</i> and <i>Banksia</i> species to further attract and assist in the pollination of ESBS species. (<i>Grevillea sericea</i> grows in the ESBS. It is unlikely to form hybrids on the site with planted <i>Grevilleas</i> of the 'toothbrush' inflorescence group (e.g. <i>Grevillea</i> 'Sandra Gordon', G.'Robyn Gordon') however, it is recommended that that the use of hybrid <i>Grevilleas</i> be minimised/restricted).	
6.1.4 ERAGROSTIS CURVULA (AFRICAN LOVE GRASS – ALG)					
A7	The Club has successfully eradicated <i>E. curvula</i> from much of the area referred to as the 'Bird Sanctuary'. However, there are still several patches of African Love Grass remaining, in particular along the margin with the 5 th fairway. This dense strip is likely to provide habitat to some of the native fauna living in this area of the golf course.	Medium	Ongoing Commence Eradication 2007/08	- This area must be managed in conjunction with area P3a. - Control - Slash African Love Grass on a regular basis to keep under control (to limit spread). Ensure grass is slashed prior to seed set. Continue with this process until time and resources are available to commence the process of eradication. - Eradication - Starting from the outer margin, spray <i>E. curvula</i> regrowth with a suitable herbicide. Continue to spray re-growth until the soil seed bank has been exhausted.	

6.1 Zone A Management Recommendations – African Love Grass (cont)					
No.	Issues	Priority	Timing	Actions	Comments
				• Move inwards continuing this process until the entire area of <i>E. curvula</i> has been eradicated. • Gradually replace each treated area with ESBS species that will provide similar dense habitat for native fauna (eg <i>Xanthorrhoea</i>, <i>Lepidosperma</i>). Refer to the recommended planting list in Appendix 14. • Prepare for planting, plant and maintain as per Guideline No. 7. •	
A8	African Love Grass between the 5 th and 7 th Fairways, adjacent to ESBS remnant B4.	Medium	Ongoing Commence Eradication 2007/08	• Proceed with the treatment of African Love Grass and other weeds in this area according to Guideline No. 3, which describes the 'Process for treating African Love Grass adjacent to an ESBS remnant.'	
A9	African Love Grass between the 7th and 17th Fairways, adjacent to ESBS remnant B3d. There is potential for <i>Melealeuca quinquinervia</i> to invade this area once <i>E. curvula</i> has been removed exposing the sandy soils. The area will need to be monitored and treated as required.	Medium	Ongoing Commence Eradication 2006/07	• Proceed with the treatment of African Love Grass and other weeds in this area according to Guideline No. 3, which describes the 'Process for treating African Love Grass adjacent to an ESBS remnant.'	

6.1 Zone A Management Recommendations – African Love Grass (cont)					
No.	Issues	Priority	Timing	Actions	Comments
A10	African Love Grass between the 7 th and 17 th greens, adjacent to ESBS remnant B3d and B3e.	Medium	Ongoing Commence Eradication 2006/07	Proceed with the treatment of African Love Grass and other weeds in this area according to Guideline No. 3, which describes the 'Process for treating African Love Grass adjacent to an ESBS remnant.'	
A11	African Love Grass between the 8 th and 18 th tees, adjacent to ESBS remnant B3a.	Medium	Ongoing Commence Eradication 2006/07	Proceed with the treatment of African Love Grass and other weeds in this area according to Guideline No. 3, which describes the 'Process for treating African Love Grass adjacent to an ESBS remnant.'	
A12	African Love Grass along the fenceline boundary with Banks Avenue, adjacent to ESBS remnant B6	Low	Ongoing Commence Eradication 2008/09	Proceed with the treatment of African Love Grass and other weeds in this area according to Guideline No. 3, which describes the 'Process for treating African Love Grass adjacent to an ESBS remnant.'	
6.1.5 LANDMARKS					
L1	Clubhouse, carpark and main entry. <i>Eucalyptus nicholii</i> have been planted around the main entry. This particular species produces dead branches which may eventually fall onto parked cars or people using the carpark, raising issues of liability should any damage or harm result.	Low	Ongoing	Club to undertake regular maintenance of <i>E. nicholii</i> in this area including regular removal of dead or dying branches.	

6.1 Zone A Management Recommendations – landmarks (cont)					
No.	Issues	Priority	Timing	Actions	Comments
	Inadequate spacing (only 3 – 4 metres) provided between the 3 Swamp Mahoganies that have been planted, at the western end of the carpark. They will also require ongoing pruning.	Medium	2005 & Ongoing	Club to carry out regular pruning of these trees. The Club should consider removing the centre tree to allow adequate room for other two trees to mature.	
6.5 ha	This area has the largest area of weed invasion on the golf course. Weeds include a number of noxious and environmental weeds. The history of use of this area presents potential issues for re-development. Native fauna are likely to inhabit this area and may be impacted by re-development.	High	2005 & Ongoing	Club to take action as required under the Noxious Weeds Act, to control noxious weeds that occur in this area. Address any concerns related to the history of use of this area, prior to re-development, as required by Botany City Council or other agencies such as the EPA. The impact of re-development works on any fauna that may inhabit this area is to be assessed prior to the commencement of works. If re-development occurs, the Club must re-plant with species that are representative of the ESBS (See Appendix 14).	

Table 6.2 - Zone B Management Recommendations					
<i>This table is to be read in conjunction with Figure 11</i>					
6.2.1 ESBS REMNANTS					
No.	Issues	Priority	Timing	Actions	Comments
B1	ESBS Remnant (B1) Complex	High	2004/05	Mark out the extent of the remnant using the technique described and depicted in Guideline No. 5.	
		Med	2006/07	Commence bush regeneration activities (which aim to protect and enhance the ESBS) as per ESBS Guideline No 2.	
B2	ESBS Remnant (B2)	High	2004/05	Mark out the extent of the remnant using the technique described and depicted in Guideline No. 5.	
		High	2004 & Ongoing	Continue bush regeneration activities (which aim to protect and enhance the ESBS) as per ESBS Guideline No 2.	
B17	ESBS Remnant (B17) The planted area E4 occupies the area where B17 is supposed to be. Although identified in the original survey report by Hirschfeld this remnant could not be located in surveys carried out by Low in 1998 and by Abel Ecology in 2003 and 2004.	Low	2008/09	Augment plantings in this area using <i>Acacia sophorae</i>.	

6.2 Zone B Management Recommendations – ESBS remnants (cont)					
No.	Issues	Priority	Timing	Actions	Comments
B18	ESBS Remnant (B18) The northern edge of this remnant is completely surrounded by <i>E. curvula</i>.  Plate 26. Gap in B18 with Heffron Rd in background. The front of the remnant is surrounded by ALG (Sept 2004).	High Medium	2004/05 2007/08	- Mark out the extent of the remnant using the technique described and depicted in Guideline No. 5. - Commence bush regeneration activities (which aim to protect and enhance the ESBS) as per ESBS Guideline No 2.	
B19	ESBS Remnant (B19) This remnant is bounded by <i>E. curvula</i> and plantings that have been made behind the 6th tee.	High	2004/05	Mark out the extent of the remnant using the technique described and depicted in Guideline No. 5.	

6.2 Zone B Management Recommendations – ESBS remnants (cont)					
No.	Issues	Priority	Timing	Actions	Comments
	 Plate 27. Photo of ESBS remnant B19, looking north (Sept 2004).	Low	2008/09	- Commence bush regeneration activities (which aim to protect and enhance the ESBS) as per ESBS Guideline No 2. - Include planting of <i>Lambertia formosa</i> and other ESBS species that attract pollinators. (The plantings behind the 6th tee already include Grevilleas which attract bird pollinators).	
6.2.2 PLANTINGS					
P1	Need to reinforce plantings between 2 nd and 4 th fairways with suitable species.	Medium	Ongoing	- Continue the gradual removal of unsuitable plantings. - Grind stumps if necessary. - Chip and stockpile as mulch for future planting sites ensuring that all mulched material is free of weed seed heads/fruit. - Order advanced trees – Get types from the recommended planting list in Appendix 14. - Prepare site for planting, plant and maintain as per Guideline No. 6.	

6.2 Zone B Management Recommendations – plantings (cont)					
No.	Issues	Priority	Timing	Actions	Comments
P1a	A small area between the 3rd green and 4th tees consists of ESBS species with an understory of African Love Grass. Apparently the ESBS species established when sand was dumped in this area years ago. This area needs to be maintained in order to control weed growth.  Plate 28. Photograph of planted area P1a looking Sth (Sept 2004).	Medium	2006/07	• Treat African Love Grass and other weeds in this area according to Guideline No. 4, which describes the 'Process for treating African Love Grass (not adjacent to the ESBS)'. • Otherwise maintain this area as per Guideline No. 6.	
P1b	Unsuitable species between 6th fairway and M2. Need to reinforce with suitable species.	Medium	Ongoing	• Continue the gradual removal of pines. • Grind stumps if necessary. • Chip and stockpile as mulch for future planting sites, ensuring that all mulched material is free of pine cones and seeds. • Prepare for planting, plant and maintain as per Guideline No. 6.	

6.2 Zone B Management Recommendations – plantings (cont)					
No.	Issues	Priority	Timing	Actions	Comments
P2	Unsuitable species between 1 st and 4 th fairways. Need to reinforce with suitable species.	Medium	Ongoing	- Remove WA Willow Myrtle (<i>Agonis flexuosa</i>) and pines. - Grind stumps if necessary. - Chip and stockpile as mulch for future planting sites, ensuring that all mulched material is weed free. - Prepare for planting, plant and maintain as per Guideline No. 6.	
P3	Unsuitable species planted between 1 st and 8 th fairways. Need to reinforce with suitable species. Dense infestation of <i>Romulea rosea</i> throughout this area.	Medium	Ongoing	- Gradually remove WA Willow Myrtle (<i>Agonis flexuosa</i>) and pines. - Grind stumps if necessary. - Chip and stockpile as mulch for future planting sites, ensuring that all mulched material is weed free. - Prepare for planting, plant and maintain as per Guideline No. 6. - Treat <i>Romulea rosea</i> as prescribed in General Recommendations Table 5.10.	Manual removal of the weed <i>Romulea rosea</i> is time-consuming and labour intensive; manual methods should be used within remnants of ESBS but herbicide application is otherwise preferred where possible. Also, prevention of seed production (mowing/slashing) will aid in reducing further spread.
P3a	The Club has plans to expand ESBS plantings in this area.	High	2005/06	- Manage this area in conjunction with A7. - Prepare the area for planting, plant and maintain as per Guideline No. 6.	

6.2 Zone B Management Recommendations (cont)				
6.2.3 EDGE PLANTINGS				
No.	Issues	Priority	Timing	Actions
E1	There are unsuitable species planted along the boundary between the 6.5 hectares and 2 nd fairway. There are some desirable views that could be enhanced by suitable plantings.	Medium	Ongoing	- Remove Coral Trees (<i>Erythrina x sykesii</i>) and other unsuitable species such as <i>Melaleuca bracteata</i>. - Grind stumps if necessary. - Chip and stockpile as mulch for future planting sites. - Select suitable replacement plants from the recommended planting schedule in Appendix 14 (suggested species include <i>Banksia aemula</i>, <i>B. integrifolia</i>, <i>Leptospermum laevigatum</i> and <i>Lambertia formosa</i>). Aim to introduce flowering shrubs to attract ESBS pollinators and to provide a link to the Grevillea's that have been planted around the 2nd tee. - Order replacement plants. - Prepare site for planting, plant and maintain as per Guideline No. 7. - Consider extending plantings into areas A1 and A2.
				Comments

6.2 Zone B Management Recommendations – edge plantings (cont)				
No.	Issues	Priority	Timing	Actions
E2b	Eastern half of boundary to UNSW David Phillips sportsfield. There is a need to remove weeds and other unsuitable plants from this area and screen the fenceline with suitable species, enhancing desirable views.	Medium	Ongoing	• Seek permission from University of NSW to carry out planting and maintenance along the shared fenceline. • Remove weeds, such as Lantana and any other unsuitable species using an appropriate technique chosen from Guideline No. 8. • Maintain at least a 1 metre buffer from retained native plants when spraying OR spray using the ESBS protective device. • Order replacement plants including vines such as <i>Kennedia rubicunda</i>, <i>Hibbertia scandens</i> and <i>Pandorea pandorana</i>. • Prepare site for planting, plant and maintain as per Guideline No. 7. • Replace climbers when they become straggly and loose their foliage.
				Comments

6.2 Zone B Management Recommendations – edge plantings (cont)				
No.	Issues	Priority	Timing	Actions
E4b	This section of the fenceline adjacent to Heffron Road has been infested with a number of Noxious and environmental weeds. There are undesirable views of the roadway.	High	2005 & Ongoing	• This area should be managed in conjunction with area M2 – the landscape storage area. • Remove Noxious weeds (Castor Oil Plant, Arundo), environmental weeds (Robinia, Tree Lucerne) and Coral Trees (<i>Erythrina x sykesii</i>). • If required, use brush matting or jute matting to stabilise exposed soils. • Grind stumps if necessary. • Chip and stockpile as mulch only if the material is free of weed propagules. • Select suitable replacement plants from the recommended planting list. • Order replacement plants. • Prepare site for planting, plant and maintain as per Guideline No. 7.
				Comments

6.2 Zone B Management Recommendations – edge plantings (cont)					
No.	Issues	Priority	Timing	Actions	Comments
E4c	There are unsuitable plantings along the boundary with Heffron Road and undesirable views of the roadway.	Low	2008/09	- Remove Coral Trees (<i>Erythrina x sykesii</i>) and any other unsuitable plantings - Grind stumps if and where necessary. Otherwise leave stumps in the ground as they will help to keep soils stable. - Chip and stockpile as mulch for future planting sites. - Select suitable replacement plants from the recommended planting list (include <i>Banksia aemula</i>, <i>B. integrifolia</i>, <i>Leptospermum levigatum</i> and <i>Lambertia Formosa</i>). - Order replacement plants. - Prepare site for planting, plant and maintain as per Guideline No. 7.	
	<i>Banksia integrifolia</i> follicles found to be affected by a fungus.  Plate 29. Photograph of fungus (Sept 04)	High	2004/05	- Apply a treatment to eradicate fungus affecting <i>Banksia</i> follicles. - If treatment is not successful the Club may need to consider removing (and disposing of plant materials off-site) and replacing affected trees in order to limit the spread of the fungus to other <i>Banksias</i> on the golf course.	

6.2 Zone B Management Recommendations (cont)					
6.2.4 ERAGROSTIS CURVULA (AFRICAN LOVE GRASS)					
No.	Issues	Priority	Timing	Actions	Comments
A1	Infestation on boundary adjacent to 6.5 Ha and UNSW David Phillips sportsfield. There are many other weeds in this area that need to be treated. <i>Acacia sophorae</i> / <i>Acacia longifolia</i> is present in this area.	Low	Ongoing Commence Eradication 2008/09	- Proceed with the treatment of African Love Grass and other weeds in this area according to Guideline No. 4, which describes the 'Process for treating African Love Grass (not adjacent to the ESBS)'. - Select and position plants so as to enhance desirable views. - Take particular caution when working around existing native shrubs such as <i>Acacia sophorae</i>/<i>Acacia longifolia</i>	
A2	Infestation on boundary adjacent to 6.5 Ha and ESBS Remnant B1	Medium	Ongoing Commence Eradication 2007/08	Proceed with the treatment of African Love Grass and other weeds in this area according to Guideline No. 3, which describes the 'Process for treating African Love Grass adjacent to an ESBS remnant.'	
A3	Infestation between two portions of ESBS Remnant B1 – near the 3 rd tees.	Medium	Ongoing Commence Eradication 2007/08	Proceed with the treatment of African Love Grass and other weeds in this area according to Guideline No. 3, which describes the 'Process for treating African Love Grass adjacent to an ESBS remnant.'	

6.2 Zone B Management Recommendations – African Love Grass (cont)					
No.	Issues	Priority	Timing	Actions	Comments
A4	Infestation between the 3 rd tees and the planted area P1.	Low	Ongoing Commence Eradication 2008/09	- Proceed with the treatment of African Love Grass and other weeds in this area according to Guideline No. 4, which describes the ‘<i>Process for treating African Love Grass (not adjacent to the ESBS)</i>’. - Manage in conjunction with P1.	
A5	Infestation between the 2 nd tees and the 2 nd fairways, adjacent to ESBS Remnant B2.	High	Ongoing Commence Eradication 2005	- Proceed with the treatment of African Love Grass and other weeds in this area according to Guideline No. 3, which describes the ‘<i>Process for treating African Love Grass adjacent to an ESBS remnant.</i>’ - Select and position plants so as to enhance desirable views.	
A6	Infestation near the 5 th green	Low	Ongoing Commence Eradication 2008/09	- Proceed with the treatment of African Love Grass and other weeds in this area according to Guideline No. 4, which describes the ‘<i>Process for treating African Love Grass (not adjacent to the ESBS)</i>’. - Select and position plants so as to enhance desirable views.	

6.2 Zone B Management Recommendations (cont)					
6.2.5 MAINTENANCE AND OPERATIONS					
No.	Issues	Priority	Timing	Actions	Comments
M2	Landscape storage area – the piles of material that surround the storage bays are infested with weeds including a number of Noxious and environmental weeds.	High	2005/06	• This area should be managed in conjunction with area E4b. • Remove Noxious weeds (Castor Oil Plant, Arundo), environmental weeds (Robinia, Tree Lucerne) and Coral Trees (<i>Erythrina x sykesii</i>). • If required, use brush matting or jute matting to stabilise exposed soils. • Grind stumps if necessary. • Chip and stockpile as mulch only if material is free of weed propagules. Note: <i>Erythrina x sykesii</i> can also propagate vegetatively and will therefore need to be either removed or composted). • Select suitable replacement plants from the recommended planting list. • Order replacement plants. • Prepare site for planting, plant and maintain as per Guideline No. 7.	

Table 6.3 - Zone C Management Recommendations					
<i>This table is to be read in conjunction with Figure 12</i>					
6.3.1 ESBS REMNANTS					
No.	Issues	Priority	Timing	Actions	Comments
B7	ESBS Remnant (B7) 	High	2004/05	Mark out the extent of the remnant using the technique described and depicted in Guideline No. 5.	
		Medium	2006/07	Commence bush regeneration activities (which aim to protect and enhance the ESBS) as per ESBS Guideline No 2.	
	Plate 30. Photo of part of remnant B7 looking west (Sept 04).				

6.3 Zone C Management Recommendations – ESBS remnants (cont)					
No.	Issues	Priority	Timing	Actions	Comments
B8	ESBS Remnant (B8) Complex  Plate 31. Photo of remnant B8d looking south (Sept 04).	High	2004/05	Mark out the extent of the remnant using the technique described and depicted in Guideline No. 5.	
		High	2005/06	Commence bush regeneration activities (which aim to protect and enhance the ESBS) as per ESBS Guideline No 2.	
B9	ESBS Remnant (B9)  Plate 32. Remnant B9 looking south (Sept 04).	High	2004/05	Mark out the extent of the remnant using the technique described and depicted in Guideline No. 5.	
		Low	2008/09	Commence bush regeneration activities (which aim to protect and enhance the ESBS) as per ESBS Guideline No 2.	

6.3 Zone C Management Recommendations – ESBS remnants (cont)					
No	Issues	Priority	Timing	Actions	Comments
B10	ESBS Remnant (B10)			The only thing remaining at the site of this remnant is a <i>Monotoca elliptica</i> stump.	
B11	ESBS Remnant (B11) Complex	High	2004/05	Mark out the extent of the remnant using the technique described and depicted in Guideline No. 5.	
	 Plate 33. Photograph of B11b taken from the 11th fairway, with a stand of Honey Myrtle (<i>Melaleuca amillaris</i>) to the right (Sept 04).	Medium	2006/07	Commence bush regeneration activities (which aim to protect and enhance the ESBS) as per ESBS Guideline No 2.	
B12	ESBS Remnant (B12)	High	2004/05	Mark out the extent of the remnant using the technique described and depicted in Guideline No. 5.	
		Low	2008/09	Commence bush regeneration activities (which aim to protect and enhance the ESBS) as per ESBS Guideline No 2.	
B13	ESBS Remnant (B13)	High	2004/05	Mark out the extent of the remnant using the technique described and depicted in Guideline No. 5.	

6.3 Zone C Management Recommendations – ESBS remnants (cont)					
No	Issues	Priority	Timing	Actions	Comments
		Low	2008/09	Commence bush regeneration activities (which aim to protect and enhance the ESBS) as per ESBS Guideline No 2.	
B14	ESBS Remnant (B14)	High	2004/05	Mark out the extent of the remnant using the technique described and depicted in Guideline No. 5.	
		Medium	2007/08	Commence bush regeneration activities (which aim to protect and enhance the ESBS) as per ESBS Guideline No 2.	
Note ESBS Remnants B15 and B16 are actually located within Mutch Park.					
6.3.2 PLANTINGS					
P9	Need to remove unsuitable species and reinforce plantings between 13 th and 14 th fairways with suitable species.	Medium	Ongoing	- Continue gradual removal of pine trees. - Identify and remove any unhealthy <i>Eucalyptus</i> sp. - Grind stumps if necessary. - Chip and stockpile as mulch for future planting sites. - Order replacement trees in advance. - Prepare site for planting, plant and maintain as per Guideline No. 6.	

6.3 Zone C Management Recommendations – plantings (cont)					
No	Issues	Priority	Timing	Actions	Comments
P9a	The Club has plans to expand plantings of ESBS species into this area in particular.	High	2005/06	• Make an assessment of plant requirements. • Order replacement trees, shrubs and groundcovers, in advance. • Prepare site for planting, plant and maintain as per Guideline No. 6.	
P10	Plantings between the 14 th & 15 th fairways. The Club has undertaken works to remove unsuitable species and replace them with more suitable species, particularly in the southern half of this area. There is now a need to maintain the newly planted areas and to continue with the removal and replacement of unsuitable species in the northern half of P10.	High Medium	2004 & Ongoing 2006/07	• Maintain recently planted area as per Guideline No. 7. • In the northern half of P10 continue with the gradual removal of Pines and any unhealthy <i>Eucalyptus</i> sp. • Grind stumps if necessary. • Chip and stockpile as mulch for future planting sites ensuring mulch is weed free. • Order replacement plants in advance, choosing appropriate species from the recommended planting list. • Prepare site for planting, plant and maintain as per Guideline No. 6.	 Plate 34. Photo of the 14th fairway, looking south from the 14th green. Area P10 extends along the right hand side of the fairway (Sept 04).

6.3 Zone C Management Recommendations – plantings (cont)				
No	Issues	Priority	Timing	Actions
P11	Need to remove unsuitable species and reinforce plantings with suitable species.	Low	Ongoing	- Identify and remove unhealthy <i>Eucalyptus</i> species. - Grind stumps if necessary. - Chip and stockpile as mulch for future planting sites. - Control areas of <i>E. curvula</i> and other weeds in accordance with Guideline No. 4; - Consider complete eradication - follow Guideline No. 4. - Order replacement plants in advance. - Prepare the area for planting, plant and maintain as per Guideline No. 6.
P12	The line of plantings between the 13 th tees and the 12 th green does not form a complete physical barrier.	Low	Ongoing	- Order additional <i>Melaleuca armillaris</i> plants well in advance of site preparation. - Prepare site for planting. - Plant so as to form a complete physical barrier. - Maintain as per Guideline No. 6.

6.3 Zone C Management Recommendations – plantings (cont)				
No	Issues	Priority	Timing	Actions
P13	The plantings around the Superintendent's House need to be reinforced with more suitable species to reduce maintenance, improve access and maintain privacy.	Low	Ongoing	• Stage work so that replanted areas are allowed to mature before adjacent areas are opened up. • Order <i>Melaleuca armillaris</i>, <i>Leptospermum laevigatum</i> or <i>Banksia aemula</i> • Remove unhealthy plants. • Prune remaining healthy shrubs to provide for easier access. • Prepare site for planting and plant as per Guideline No. 7. • Maintain a deep mulch layer to reduce the frequency of follow-up weeding.
P14	The plantings around the Maintenance Depot and office need to be maintained.	Low	Ongoing	• Remove unhealthy plants. • Prune healthy shrubs to provide for ease of access to buildings. • If additional plantings are required, prepare the site for planting and plant as per Guideline No. 7. • Maintain a deep mulch layer to reduce the frequency of follow-up weeding.
6.3.3 EDGE PLANTINGS				
E5	The plantings along the boundary with Heffron Road include some unsuitable species and several non-local natives. There are still some undesirable views of the roadway. Previous plantings may need to be thinned in time.	Medium	2006 & Ongoing	• Remove the remaining Coral Tree (<i>Erythrina x sykesii</i>) from this area. • Eradicate African Love Grass directly adjacent to the fenceline by slashing and spraying with an appropriate herbicide. Replant the area with trees and shrubs so that when mature they will screen views of Heffron Road.

6.3 Zone C Management Recommendations – edge plantings (cont)				
No	Issues	Priority	Timing	Actions
				• Continue to slash remaining African Love Grass to keep under control (to limit spread). Ensure grass is slashed prior to seed set. • Gradually remove any non-local natives and replace with ESBS species. • Consider thinning previously planted areas to allow for adequate plant spacings, particularly as shrubs and trees mature. • Mulch the newly planted strip in the middle of this area to stabilise exposed sandy soils. • Grind stumps of any trees that are removed, where necessary. • Chip and stockpile as mulch for future planting sites. • Prepare site for planting, plant and maintain as per Guideline No. 7. •
E6	The Club has undertaken works along this fenceline to remove unsuitable species and replant with ESBS species. Once the new plantings mature they should provide an adequate screen from the undesirable views of the roadway and shopping centre. The mid-section has mature canopy species but lacks shrubs and or groundcovers. Newly planted areas will need to be maintained.	Low	Ongoing	• Reinforce plantings in the mid-section with shrubs and groundcovers from the recommended planting list. • Prune vegetation as required. • Replace any plant deaths in the newly planted area. • Treat any weeds that emerge in the newly planted area with an appropriate herbicide.

6.3 Zone C Management Recommendations – edge plantings (cont)				
No	Issues	Priority	Timing	Actions
				• Restrict access to planted areas by maintaining “No Carts, No Buggies” signs at regular intervals along the fairway side of this area. • Maintain as per Guideline No. 7.
E7	The south-eastern corner of E7 has been planted out with a mix of ESBS and non-ESBS species. Once appropriate plantings mature in this area, they should provide an adequate screen from the undesirable views of the roadway and intersection on Wentworth Avenue.	Medium	2006 & Ongoing	• Gradually remove any non-local natives and replace with ESBS species. • Maintain the area per Guideline No. 7. • Reinforce plantings behind the 12th tees with ESBS species to provide a screen from Wentworth Avenue. • Prepare site for planting, plant and maintain as per Guideline No. 7. • The south-western corner of E7, which has historically been referred to as the ‘bird sanctuary’ is almost completely covered by African Love Grass. Management of this area is addressed below under A14.
E8	There are undesirable views of the dumpsite plus the need to enhance desirable views of the park.	Medium	2006 & Ongoing	• Reinforce existing canopy species with shrubs (Acacias, Banksias) and groundcovers. Select plants from the recommended planting schedule in Appendix 14. Locate shrubs so that, once mature they will screen undesirable views of the adjacent dumpsite. • Prepare site for planting, plant and maintain as per Guideline No. 7.

6.3 Zone C Management Recommendations – edge plantings (cont)					
No	Issues	Priority	Timing	Actions	Comments
E8a	The Club plans to extend ESBS plantings from the fenceline toward the 13 th green.	High	2005/06	- Select plants from the recommended planting schedule in Appendix 14. Locate shrubs so that, once mature they will screen undesirable views of the adjacent dumpsite. - Prepare site for planting, plant and maintain as per Guideline No. 7.	
6.3.4 ERAGROSTIS CURVULA (AFRICAN LOVE GRASS)					
A13	Infestation between the 13 th and 16 th greens, surrounding ESBS Remnants B8a and B8b.	Medium	Ongoing Commence Eradication 2006/07	Proceed with the treatment of African Love Grass and other weeds in this area according to Guideline No. 3, which describes the ‘<i>Process for treating African Love Grass adjacent to an ESBS remnant.</i>’	
A14	Infestation within the ‘bird sanctuary’ adjacent to Mutch Park and Wentworth Avenue.	Medium	Ongoing Commence Eradication 2006/07	- Proceed with the treatment of African Love Grass and other weeds in this area according to Guideline No. 4, which describes the ‘<i>Process for treating African Love Grass (not adjacent to the ESBS)</i>’. - Select and position plants so as to enhance desirable views into Mutch Park, and screen undesirable views of Wentworth Avenue.	

6.3 Zone C Management Recommendations – African Love Grass (cont)					
No	Issues	Priority	Timing	Actions	Comments
A15	Infestation between the 12 th fairway and the 14 th green, surrounding remnant B13	Low	Ongoing Commence Eradication 2008/09	Proceed with the treatment of African Love Grass and other weeds in this area according to Guideline No. 3, which describes the ‘<i>Process for treating African Love Grass adjacent to an ESBS remnant.</i>’	
A16	Infestation between the 12 th tees and the 11 th fairway	Low	Ongoing Commence Eradication 2008/09	- Proceed with the treatment of African Love Grass and other weeds in this area according to Guideline No. 4, which describes the ‘<i>Process for treating African Love Grass (not adjacent to the ESBS)</i>’). - Select and position plants so as to enhance desirable views.	
A17	Infestation between the 15 th tees and the 11 th fairway, adjacent to remnant B11c	Medium	Ongoing Commence Eradication 2006/07	Proceed with the treatment of African Love Grass and other weeds in this area according to Guideline No. 3, which describes the ‘<i>Process for treating African Love Grass adjacent to an ESBS remnant.</i>’	
A18	Infestation on boundary with Heffron Road adjacent to remnant B7	Low	Ongoing Commence Eradication 2008/09	- Proceed with the treatment of African Love Grass and other weeds in this area according to Guideline No. 3, which describes the ‘<i>Process for treating African Love Grass adjacent to an ESBS remnant.</i>’). - Select and position plants so as to, and screen undesirable views of Heffron Road.	

6.3 Zone C Management Recommendations (cont)					
No	Issues	Priority	Timing	Actions	Comments
6.3.5 MAINTENANCE AND OPERATIONS					
M3	Unsuitable plantings and undesirable views of the maintenance depot.	Low	Ongoing	- Remove unsuitable trees and understorey shrub species. - Order tree, shrub, grass, groundcover and vine species as per Guideline No. 7. - Prepare planting site, plant and maintain according to Guideline No. 7.	
6.3.6 LANDMARKS					
L2	Flagstaff Hill	High	2005/06	- Plan a schedule of works for this area. - Order grasses and <i>Hibbertia scandens</i> well in advance of planting date to ensure plants are available on time. - Control weeds using a herbicide. - Use coarse (logs, branches) and fine (twigs, mulch) brush matting or jute matting as required to stabilise soils. - Plant out the site. - Maintain according to Guideline No. 7. - Trial propagation of the native surface algae by collection/dissolving/spraying it onto the bare sand surface.	

7. Vegetation Management Guidelines

Guideline No. 1 - Protection and Management of the Eastern Suburbs Banksia Scrub (ESBS) an Endangered Ecological Community.

WARNING

There are severe penalties associated with harming, picking or damaging habitat of the Eastern Suburbs Banksia Scrub (ESBS).

Any person that causes harm to any animal that is part of the ESBS or the picking of any plant that is part of the ESBS can incur a penalty of **2,000 penalty units (\$210,000) or imprisonment for 2 years or both.**

Any person that causes damage to habitat of the ESBS can incur a penalty of **1,000 penalty units (\$110,000) or imprisonment for 1 year or both.**

It is a defence to a prosecution for an offence if the accused proves that the act constituting the alleged offence was authorised to be done, and was done in accordance with, a general licence (such as a scientific licence issued under 132C of the National Parks and Wildlife Act 1974) or a certificate issued under section 95 (2) of the *Threatened Species Conservation Act 1995*.

Ground staff and players must be made aware of the value of the Eastern Suburbs Banksia Scrub remnants and their obligations under the *NSW Threatened Species Conservation Act (1995)* and the *National Parks and Wildlife Act (1979)*.

Practical guidelines

Please note, most of the actions described below, if carried out, would constitute harm, a pick or damage to the ESBS and will therefore be liable to prosecution as detailed above, unless permitted under a relevant licence.

Only enter remnant vegetation when absolutely necessary - machinery and humans easily damage adult plants and regenerating seedlings. Clearly marking out remnant boundaries as per Guideline No. 5 will help to minimise unnecessary entry.

Do not mow or slash into remnant vegetation – particular care must be taken when carrying out maintenance activities near remnant vegetation. Regenerating seedlings and mature shrubs are easily damaged by mowers and whipper snippers.

Do not dump grass clippings or other waste vegetation into remnant vegetation - these add nutrients to the very low nutrient soils, reducing the vigour of plants adapted to these soils and encouraging weed invasion. Put all grass clippings and organic waste material into designated bays.

Do not dump or stockpile sand, construction or waste materials in remnant vegetation - these materials smother and kill plants, cause physical damage to root systems and above ground parts and compact the soil around the root systems. They also add nutrients to low nutrient soils.

Do not plant into remnant vegetation - exotic and non-locally collected species may act like weeds and compete with the remnant species. Planting non-locally collected species will destroy the scientific value and genetic integrity of the remnants. All alien plants are to be removed from the remnants.

Prevent irrigation water and fertiliser from entering remnant vegetation- ESBS plants are adapted to dry, low nutrient soils.

Prevent herbicides from entering remnant vegetation - this includes direct spraying and spray drift from nearby weed control.

Prevent other chemicals (e.g. pesticides) from entering remnant vegetation - ESBS depends on soil organisms known as mycorrhizal fungi which help the plants to absorb nutrients and improve their resistance to drought and disease. These fungi, as well as beneficial insects and other organisms associated with native vegetation, are adversely affected by horticultural chemicals.

Do not change soil levels around remnant plants

Do not prune remnant plants unless permitted under a licence obtained from the DEC.

Protection of remnants during construction activities

Additional protective measures are required to protect ESBS remnants during construction activities. Protective fencing is to be installed around any ESBS remnant within 100 m of construction works. The fencing must include an effective silt barrier to protect the remnant from eroded sediments or runoff during construction. Protective fencing is to be maintained in working order for the duration of building or development works.

Guideline No. 2 - Process for Restoring the ESBS

All restoration works associated with the ESBS on Bonnie Doon Golf Course must be carried out in accordance with: a current 132C Scientific Licence and its associated conditions, the general guidelines and recommendations provided in Table 5.11 and Table 5.12; and Guideline No. 1.

1. Initial assessment of the remnant

- Identify specific areas to be worked. Identify all species present, indigenous and non-indigenous in these areas.
- Check the remnant for active erosion. Stabilise any eroding areas by either placing hardwood logs across the slope of the land and carefully staking them in position or laying down brush matting. Avoid causing damage to indigenous plants.

1. Control of ALG

- Cut the heads of the African Love Grass to a height of 20-25cm using secateurs. Secateurs are to be sharp and cleaned with methylated spirits before use to reduce the possibility of introducing plant diseases or weed propagules. The aim of this step is to regularly remove grass heads in order to keep under control (to limit spread), but to maintain enough height to minimise disturbance to faunal habitat.
- Whenever possible cut grass heads prior to seed set. If grass is flowering, de-seed the tussocks, bag and remove all propagules from the site.
- Continue with this process until time and resources are available to commence the process of eradication.

2. Eradication of African Love Grass and other weeds

- Remove all weeds **gradually** commencing with patches no greater than 3m² to minimise erosion and habitat disturbance.
- Starting from the outer edge of the remnant, dig out or spray *E. curvula* with a suitable herbicide.
- The judicious application of herbicide is permitted in remnants but only when subject to the guidelines on 'Herbicide Use' contained in Table 5.11.
- Continue to dig out or spray re-growth until the soil seed bank has been exhausted.
- Move inwards continuing this process until the entire area of *E. curvula* has been controlled.
- Work to connect the areas of native regeneration (weed control zones).
- Control any other weeds that are present or that emerge in the treated area. Herbicides may be used in weed control, but only when subject to the guidelines on 'Herbicide Use' contained in Table 5.11.
- Commence monitoring for natural regeneration as described in Step 6.

5. Erosion Control

- Use brush matting to stabilise exposed sandy soils.

6. Monitoring for natural regeneration

- Monitor the each treated area for regenerating ESBS seedlings.
- Monitor at least annually, for the first 5 years (after initial weed controls), to assess which ESBS species (if any) are regenerating naturally in response to weed controls. Keep records of the numbers and types of any plants that regenerate.

7. Reconstruction through revegetation

- If natural regeneration is not evident at any stage within the five-year period consider re-planting the area with ESBS species.

- This decision on whether or not to re-plant should be made in consultation with a suitably qualified bush regenerator (preferably the person(s) who has been coordinating bush regeneration works within the remnant).
- Maintain records of the types and numbers of species planted.
- Prepare the site for planting and plant as per Guideline No. 7.
- Maintain the site as per Guideline No. 7.

Guideline No. 3 - Process for treating African Love Grass adjacent to an ESBS remnant

All work adjacent to the ESBS must be carried out in accordance with Guidelines No. 1 and 2, and the general recommendations given in Table 5.11.

1. Establishing and Maintaining a 2m Buffer (Refer to Figure 13)

- b. Establish and maintain a 2m buffer from the edge of the remnant, in order to strengthen the remnant edge. (The edge of the remnant should be clearly marked with stakes; refer to Guideline No. 5).
- c. Proceed with Step 3 only, which involves Preparation for Eradication.
- d. Commence eradication by slashing the 2m buffer area. Ensure that the slasher has protective sides in place in order to stop any of the slashed plant material being propelled into the adjacent remnant.
- e. If sufficient resources are available then, start removing the ALG and any other weeds from the 2m buffer area. Weed removal is best undertaken by hand. Herbicides may be used within the buffer area, but only when subject to the guidelines on 'Herbicide Use' contained in Table 5.11.
- f. Continue this process until all the ALG has been eradicated. Then proceed with Steps 5, 6 and 7.
- g. If sufficient resources are not available to proceed with complete eradication of weeds from the buffer, then continue to slash the buffer on a regular basis, until resources become available.

2. Control of ALG (Outside the 2m buffer)

- Slash African Love Grass (outside the buffer) to a height of 20-25cm. The aim is to regularly remove grass heads in order to keep under control (to limit spread), but to maintain enough height to minimise the impact on fauna. Whenever possible slash grass heads prior to seed set.
- Continue with this process until time and resources are available to commence the process of eradication.

3. Preparation for Eradication

- Prior to commencing eradication consult with a suitably qualified person (botanist/bush regenerator) on the types and numbers of ESBS species that are likely to be required for re-planting, once the ALG has been eradicated.
- Arrange for the propagation of appropriate plants to ensure that they will be available when required. (In this regard, the propagation and establishment of Grass Trees (*Xanthorrhoea resinifera*) from the site will be valuable, particularly in providing long-term habitat replacement).
- All plantings must be sourced from stock of local provenance (in this case within the bounds of the golf course). Maintain records to verify local provenance.

4. Eradication

- Starting from the outer edge of the 2m buffer, dig out or spray a 1-2m strip of *E. curvula* regrowth with a suitable herbicide. Continue to spray re-growth in order to deplete the soil seed bank.
- Control any other weeds that are present or that emerge in the treated area.
- Commence monitoring for natural regeneration as described in Step 6.
- As resources allow, move outwards continuing this process until the entire area of *E. curvula* has been controlled. (This is a long-term goal).

5. Erosion Control

- Use brush matting to stabilise exposed sandy soils. Do not mulch the site.

6. Monitoring for natural regeneration

- Monitor the treated area for regenerating ESBS seedlings.
- Monitor each treated section at least annually, for the first 5 years, to assess which ESBS species (if any) are regenerating naturally in response to weed controls. Keep records of the numbers and types of any plants that regenerate.

7. Reconstruction through revegetation

- If natural regeneration is not evident at any stage within the five-year period consider re-planting the area with ESBS species.
- This decision on whether or not to re-plant should be made in consultation with a suitably qualified bush regenerator (preferably the person(s) who has been coordinating bush regeneration works within the adjoining ESBS remnant).
- Maintain records of the types and numbers of species planted.
- Prepare the site for planting and plant as per Guideline No. 7.
- Maintain the site as per Guideline No. 7.

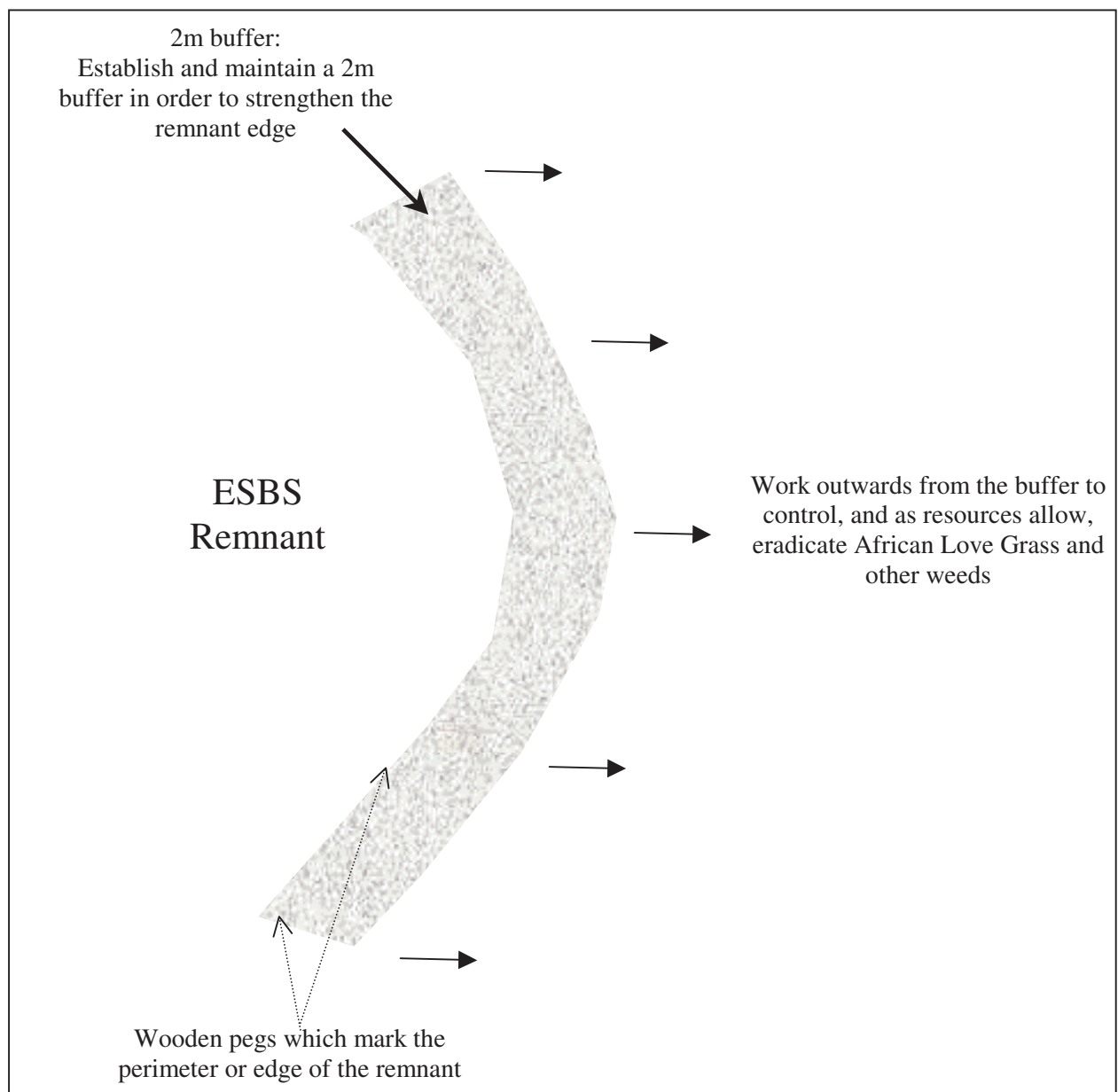


Figure 13. Method for establishing a buffer alongside an ESBS remnant

Guideline No. 4 - Process for treating African Love Grass and other weeds (when not adjacent to the ESBS)

1. Control of African Love Grass (ALG)

- Slash a 1-2m strip at the outer edge of the ALG to ground level.
- De-seed tussocks if required, bag and remove all propagules from the site.
- Slash the remaining African Love Grass to a height of 20-25cm. The aim is to regularly remove grass heads in order to keep under control (to limit spread), but to maintain enough height to minimise the impact on fauna. Whenever possible slash grass heads prior to seed set.
- Continue with this process until time and resources are available to commence the process of eradication.

2. Preparation for Eradication

- Prior to commencing eradication consult with a suitably qualified person (botanist/bush regenerator) on the types and numbers of ESBS species that are likely to be required for re-planting, once the ALG has been eradicated.
- Arrange for the propagation of appropriate plants to ensure that they will be available when required. (In this regard, the propagation and establishment of Grass Trees (*Xanthorrhoea resinifera*) from the site will be valuable, particularly in providing long-term habitat replacement. Note that proper curation & storage of this seed will be critical, as infructescences are a favourite host of insect larvae).

All plantings must be sourced from stock of local provenance (in this case within the bounds of the golf course). Maintain records to verify local provenance.

3. Eradication of ALG

- Starting from the outer edge of ALG re-slash the 1-2m strip of *E. curvula* to ground level.
- As *E. curvula* regrows dig out or spray with a suitable herbicide. Continue to spray re-growth in order to deplete the soil seed bank.
- Move inwards continuing this process until the entire area of *E. curvula* has been controlled.

4. Eradication of other weeds

- Remove any other weeds that emerge in the areas treated for ALG using an appropriate technique.
- Remove other weeds gradually to minimise erosion and habitat disturbance. In order to facilitate this, work is best carried out in a mosaic pattern and in a number of different areas at the same time.

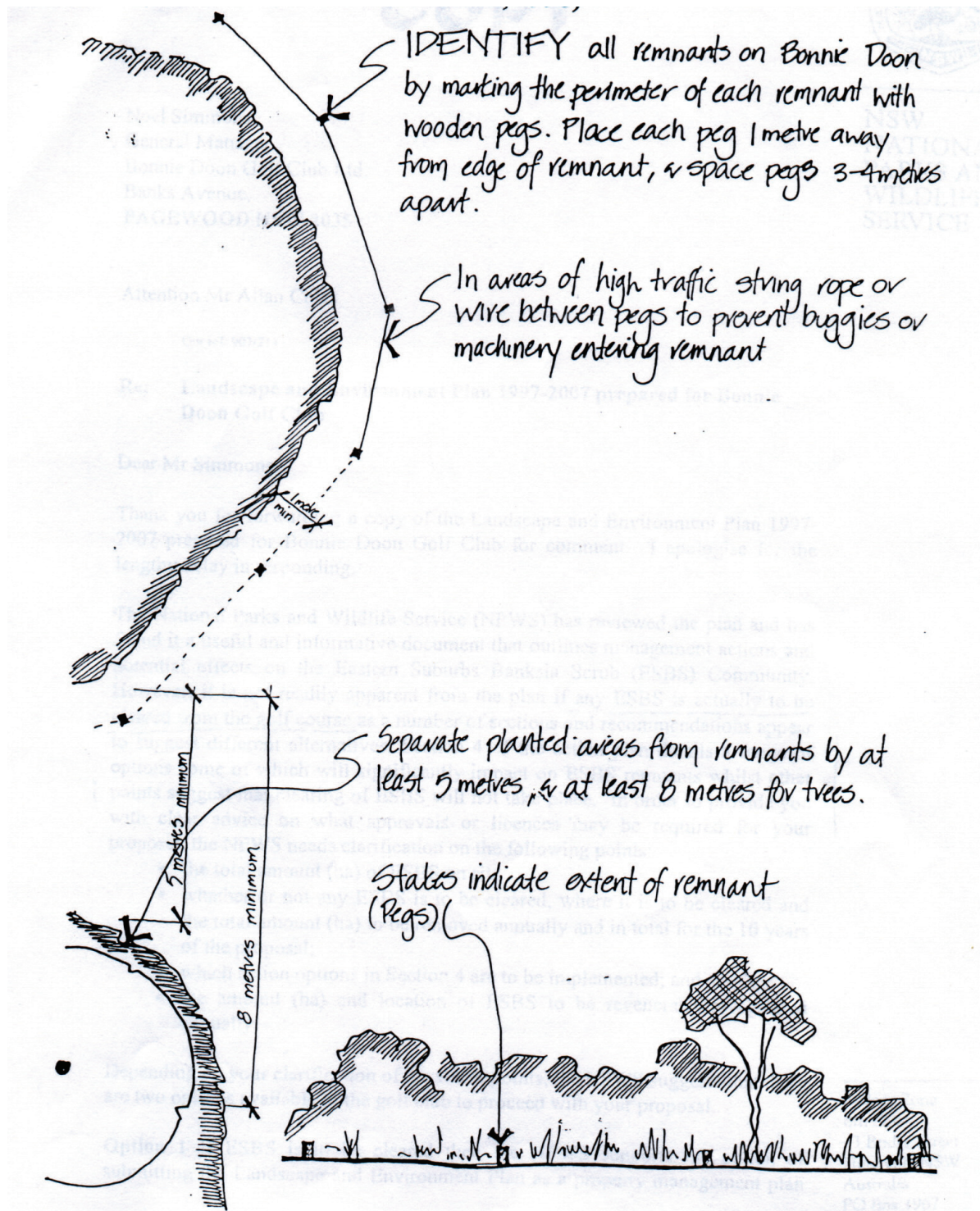
5. Erosion Control

- Use brush matting or mulch to stabilise exposed sandy soils.

6. Reconstruction through revegetation

- This decision on whether or not to re-plant the area should be made by the Club in consultation with a suitably qualified person (horticulturalist/botanist).
- Maintain records of the types and numbers of species planted.
- Prepare the site for planting and plant as per Guideline No. 7.
- Maintain the site as per Guideline No. 7.

Guideline No. 5 - Method for marking out the current extent of the ESBS remnants



Guideline No. 6 - Tree Planting in Turf

REMEMBER – Trees are not to be planted within 8 metres of remnant vegetation. See Guideline No. 5 for further information.

Initial Preparations (may be required 1-2 years prior to planting)

- Assess the area to be planted.
- Prepare a list of required trees using the plant schedule provided in Appendix 14.
- Order advanced trees (1-2 years ahead of time) from either Randwick Council's Community Nursery or Rockdale Community Nursery. (The Club may need to arrange for the collection of seed or cuttings in order for the nurseries to propagate appropriate plants).

Preparing the site for Planting

- If necessary, remove unsuitable plantings (Coral Trees, etc.) as prescribed in the Action Plan.
- Prepare the ground surface by poisoning turf 2 weeks before planting.

Planting

- Position plants, dig holes, plant, stake and water in well.
- Mulch to a depth of 100mm with a minimum radius of 1 metre from the trunk.
- Do not put collar guards on planted trees.

Maintenance of plantings

- Water plants daily for the first week, then weekly for first 3 months. Thereafter as necessary.
- Inspect new plantings regularly for health. Remove any dead plantings and replace with new stock. If rabbits or other fauna are found to be causing damage to plants, install tree guards to protect them. Tree guards will need to be removed once plants are over 0.5 metres in height. If disease or insect damage are detected, treat the plants with an appropriate pesticide.
- Maintain weed-free, mulched area around base of trunk for at least 2 years.

Guideline No. 7 - Mass Planting

REMEMBER

Do not plant shrubs or groundcovers within 5 metres of remnant vegetation.

Do not plant trees within 8 metres of remnant vegetation.

See Guideline No. 5 for further information.

Preparation for Planting

- Carry out an assessment of the numbers and types of plants required using the Plant Schedule provided in Appendix 14 and the required planting densities provided below.
- Grasses and groundcovers are to be planted at an average density of at least 4 to 5 plants per square metre.
- Shrubs are to be planted at an average density of at least 1 to 2 plants per square metre.
- Trees are to be planted at a density determined by the Club's Horticulturalist.
- Use tubestock for all plantings including trees.
- Order tubestock 3-6 months in advance.
- If required, install hardwood edging around the planted area.
- If necessary, mulch the entire planting bed to a depth of 100mm.

Planting

- Position plants, dig holes, plant, water and stake if required.
- Do not put collar guards on planted trees.

Maintenance of plantings

- New plantings should be regularly inspected for health. Remove any dead plantings and replace with new stock. If rabbits or other fauna are found to be causing damage to plants, install tree guards to protect them. Tree guards will need to be removed once plants are over 0.5 metres in height. If disease or insect damage are detected, treat the plants with an appropriate pesticide.
- Water plants daily for the first week, then weekly for up to 3 months during the growing period. Thereafter as necessary.
- Maintain beds weed-free and replace mulch as necessary.

Guideline No. 8 - Weed Control Techniques

It is important to identify weeds accurately and to choose the most appropriate method of control, while taking into consideration the costs of control and the potential environmental impacts. Weed control is to be carried out in a manner that minimises negative environmental impacts. This means using non-chemical control methods wherever they are practical and likely to be effective.

Refer to the specific instructions given for carrying out weed control in the ESBS before implementing any of the following techniques.

Hand Pull

1. Remove and bag seed heads and flowers.
2. Grasp the plant firmly from the base of the stem.
3. Gently pull the plant out with constant pressure.
4. Shake off any excess dirt attached to the roots.

Cut and Paint

1. Cut the stem as near towards the ground as possible, leaving a horizontal surface so the herbicide does not run off.
2. Paint on the open wounds with herbicide across the whole surface evenly (within 30 seconds of cutting the stem).
3. Make sure that each stem has been treated in the same way.

Scrape and Paint

1. Scrape a vertical section of the bark off both sides of the stem (with a sharp knife) approximately five centimetres in length, near the ground, without ringbarking the plant.
2. Apply herbicide on the open wound (as per the cut and paint method).
3. Make sure that each stem has been treated in the same way.

Foliar Spray

1. Spray designated areas using a herbicide.
2. Make sure that when spraying the whole plant is treated.
3. Only spray healthy actively growing plants.
4. Do not spray:
 - in windy conditions;
 - plants that are heavy with dew;
 - if rain is expected in the next four hours.

8. Bibliography

- Abel Ecology (2005). *Baseline Flora and Fauna Condition Report for Bonnie Doon Golf Club*, Banks Avenue, Pagewood. Blue Mountain Wilderness Services Pty. Ltd., Faulconbridge.
- Adam, P. (2001). Editorial "A role for restoration ecologists in endangered community conservation?" In *Ecological Management and Restoration*, 2 (3): 165-166.
- Anheluk, O. (1994). *A landscape history of Botany, Sydney, NSW*. June 1994.
- Audubon International (2002). *A guide to environmental stewardship on the golf course*. Second Edition.
- Australian Golf Union (1998). *Environmental Strategy for Australian Golf Courses*.
- Benson, D. H. and Howell, J. (1994). The Natural Vegetation of the Sydney 1: 100 000 map sheet. *Cunninghamia*, 3(4).
- Benson, D.H. and Howell, J. (1990). *Taken for granted: the bushland of Sydney and its suburbs*. Kangaroo Press, Kenthurst.
- Benson, D. and Howell, J. Sydney's Vegetation 1788 - 1988 - Utilisation, Degradation and Rehabilitation. *Proc. Ecological Society of Australia* 16, pp 115-127. 1990 (1).
- Bremner, M. (1999). *Proposed Restoration Strategy for Eastern Suburbs Banksia Scrub Remnant Vegetation at Bonnie Doon Golf Course*.
- Briggs, J. D., and Leigh, J. H. (1995). *Rare or Threatened Australian Plants*. CSIRO, Canberra.
- Brouwer, J. and Garnett, S. (Eds) (1990). *Threatened Birds of Australia, an Annotated List*. Royal Australasian Ornithologists' Union, Moonee Ponds.
- Bruntland, G. (ed.), (1987), "Our common future: The World Commission on Environment and Development", Oxford, Oxford University Press.
- Chapman G.A. & Murphy C.L. (1989) *Soil Landscapes of the Sydney 1:100 000 sheet* Soil Conservation Service of NSW, Sydney
- City of Botany Bay (1999). *1999 State of the Environment Report*. Botany Bay City Council, Mascot NSW.
- Clements, A., Moore, R., Holdway, P., Rodd, T., Rodd, J. and McDonald, A. (2001) *Flora assessment: Proposed "Banksia Grove" residential subdivision, Bundock Street, Randwick*.
- Cogger, H. G. (1983). *Reptiles and Amphibians of Australia*. Reed, Frenchs Forest.
- Couston, M. (2002). *Eastern Suburbs Banksia Scrub Survey and Assessment, Impact of Proposed Development at Bonnie Doon Golf Course, Pagewood*. Footprint Green PTY Ltd, Avalon Beach, NSW 2107.
- Cunningham, C.J. (1984). Recurring natural fire hazards. In *Applied Geography*. (1984). 4. pp.5-27.
- Dalgleish, E. (1999). Effectiveness of invertebrate and vertebrate pollinators and the influence of pollen limitation and inflorescence position on follicle production of *Banksia aemula* (Family Proteaceae). *Australian journal of Botany*, 47, pp.553-562.
- Department of Conservation and Land Management (CALM). *Soil Landscape Series Sheet 8930* (Katoomba).
- Department of Conservation and Land Management (CALM). *Soil Landscape Series Sheet 9030* (Penrith).
- Department of Environment and Conservation (2004). *Eastern Suburbs Banksia Scrub Endangered Ecological Community Recovery Plan*. DEC, Hurstville.

- DIPNR (Department of Infrastructure, Planning and Natural Resources, 2003). *Bringing the Bush back to Western Sydney*. DIPNR, Parramatta.
- Douglas Partners Pty. Ltd. (2003). *Proposed Alterations to Bonnie Doon Golf Course – Geotechnical and Environmental Appraisal*.
- Ehmann, H. (1992). *Encyclopedia of Australian Animals Reptiles*. Angus and Robertson, Pymble.
- Ehmann, H. (Ed.) (1996). Overview Chapter, pp.13-42. In *Threatened Frogs of New South Wales: Habitats, Status and Conservation*., Frog and Tadpole Study Group of NSW Inc, PO Box A2405, Sydney South 2000.
- EPBC Act (1999). Guidelines and species lists as updated to September 2004.
- Fairley, A. and Moore, P. (1989). *Native Plants of the Sydney District An Identification Guide*. Kangaroo Press, Kenthurst.
- Gibbs, and Shallard (1882). *An Illustrated Guide to Sydney 1882*. Gibbs and Shallard, 1882.
- Griffiths, K. (1987). *Reptiles of the Sydney Region*. Three Sisters Publication, Winmalee.
- Gutteridge, Haskins & Davey Pty Ltd (1993). *Botany Wetlands Draft Environmental Management Plan*. Prepared for the Sydney Water Board (Sydney-Illawarra-Blue Mountains).
- Hirschfeld, D. (1997). *Remnant indigenous flora survey, 1997*. City of Botany. Sauveterre.
- Hirschfeld, D. (1998). *Bonnie Doon golf course and Eastern Suburbs Banksia Scrub. Draft*. Sauveterre.
- Jankowski, J. and Knight, M.J. (1991). *Impact of Polluted Discharging Groundwaters on the Water Chemistry of the Wetlands. Challenges for Sustainable Development*: Int. Hydrology and Water Resources Symposium, 2-4 Oct, 1991, Perth, Abstract.
- Leeson, G. (1987) *Just a Dump?* Landscape Architecture Thesis CCAE, unpublished.
- Lesak, J. (2000) Honours Thesis: *Effect of smoke water on a soil seedbank: Is glasshouse germination a valid test of field response?* The University of New South Wales. In DEC, 2004.
- Low, K. (2003). *Environment Management Plan for Bonnie Doon Golf Club*. Draft. Kate Low and Associates.
- Low, K. & Ondinea, D. (1998). *Landscape and Environment Plan 1997-2007*. Prepared for Bonnie Doon Golf Club. Kate Low and Associates & Danie Ondinea, Designing for Wildlife. Zetland, NSW.
- Lugowski, A., Nakhla, G., Gravelle, M. (2002). “*Treatment of high strength leachate by biological nutrient removal processes*”. CSCE/EWRI of ASCE Environmental Engineering Conference Niagara 2002. (Available as a web document)
- Milburn, V, with Amy, J. (1997) *Ye banks and braes o’ bonie Doon. A history of Bonnie Doon Golf Club 1897-1997*. Bonnie Doon Golf Club 1997.
- NSW National Parks and Wildlife Service (1996). *Threatened Species Management Information Circulars: Circular No. 2*. NSW National Parks and Wildlife Service, Hurstville.
- NSW National Parks and Wildlife Service (2003). *Draft Recovery Plan for Eastern Suburbs Banksia Scrub*.
- NSW NPWS (2003). Threatened species information circular. *Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion (March 2003)*.
- NSW Scientific Committee (1999). *Final Determinations 1997*. Eastern Suburbs Banksia Scrub, Gazetted 13/06/97, pp 53-54. NSW National Parks and Wildlife Service, Hurstville

- Pyke, G. H. and White, A. W. (1996) Habitat requirements for the Green and Golden Bell Frog *Litoria aurea* (Anura: Hylidae). *Australian Zoologist* 30(2): 224-232.
- Rannard, J. (2001). *Bonnie Doon Golf Course Bush Regeneration Annual Report. July 2000 – June 2001*. The National Trust of Australia (NSW) Sydney.
- Sauveterre (1997). *Flora Report – Remnant Vegetation in the Botany Bay LGA*. Unpublished Report for City of Botany Bay.
- Sim, R. (1992). *The Contribution of Urban Runoff to Surface Waters in the Botany Wetlands*, Thesis submitted for the degree of “Master of Science’ (Honours), Dept. Geography of Wollongong.
- Simpson, K., Day, N. & Trusler, P. (1996). *Field Guide to the Birds of Australia*. Penguin, Ringwood, Vic.
- Sydney Water (2003). *Botany Wetlands – Weed management and Revegetation (2001-02)*. Environment & Innovation Division. 51 Hermitage Road, West Ryde, NSW.
- Sydney Water & Parsons Brinckerhoff (2003). *Georges River Program, Stage 2. Volume 1. Environmental Impact Statement*. Rhodes, NSW.
- Sydney Water & Parsons Brinckerhoff (2003). *Georges River Program, Stage 2. Volume 3 – Technical Papers 5 to 10. Environmental Impact Statement*. Rhodes, NSW.
- Thorp, W., McDonald, B., Burton, and C., Brassil, T. (1991). *Botany Wetlands Heritage Study. report prepared fro the Federal Airports Corporation and Sydney Water*.
- Turbet, P 1989. *The Aborigines of the Sydney District before 1788*. Kangaroo Press, Sydney.
- Wilson, K.A. (2004). *Botany Wetlands Bird Survey: April 2003 to February 2004*. Sydney Water Corporation.
- Wotherspoon, D. (1998) *Camden Lakeside 1998 Biodiversity Report*, Blue Mountain Wilderness Services Pty. Ltd., Faulconbridge.
- Wotherspoon, D. (1998) *Camden Lakeside, Spring 1998, Biodiversity Survey*, Blue Mountain Wilderness Services Pty. Ltd., Faulconbridge.
- Wotherspoon, D. (1998) *Camden Lakeside, Winter 1998, Biodiversity Survey*, Blue Mountain Wilderness Services Pty. Ltd., Faulconbridge.
- Wotherspoon, D. (1999) *Camden lakeside, 1999, Biodiversity Report*, Blue Mountain Wilderness Services Pty. Ltd., Faulconbridge.
- Wotherspoon, D. (2000) *Camden Lakeside, 2000, Biodiversity Report*, Blue Mountain Wilderness Services Pty. Ltd., Faulconbridge.

Appendix 1. Brief history of local ESBS clearance

c. 1812: Simeon Lord acquired from Edward Redmond 135 acres on W. side of “Blackwattle Creek”. This was dammed to make the “Mill Pond”. Later, Lord acquired 600 acres on the E. side of this creek and developed a wool mill and a textile mill.

1830’s:

Market gardens & wool scours established in the wetlands area.

1829-1833

Thomas Woore recorded that “Much stunted timber and some large trees were at that time growing on the sand slopes in sheltered hollows and the whole was covered with a thick coat of brushwood”.

1856

Botany pumping station – construction began. Apparently no significant alteration to the original landscape & topography occurred from these works.

1867

Sandy hills covered by small scrub; flats & swamps between hills are covered with sandy bog (peat ?) to 16-18 deep, with a constant water flow.

1869 – from the 1830’s to 1869

However, a Committee of Inquiry in 1869 records that since the 1830’s the local area had dried up, numerous bushfires had occurred, and the land had been grazed. Only a small portion of the original swamp remained near the station and there were many barren sand hills.

1882

Most of the native vegetation has been cleared or heavily disturbed

“There are of course a few specimens of wild flora, but in nothing like their old magnificence” – from Gibbs & Shallard, *An illustrated guide to Sydney 1882*.

1928-1930

Eastlakes golf course construction begun. Course opened 1930. Amount of vegetation clearing unknown.

1950’s

Several areas along Gardeners Road (north-west of Bonnie Doon course) were developed as market gardens.

Mutch Park sand-mined during 1955-73, mostly cleared by c.1965 (photo in Anheluk, p.72), (directly west of Bonnie Doon course, southern section)

1960’s

Mutch Park, Astrolabe Park, portions of East Lakes golf course levelled. Mutch Park contained what was known as “Flagstaff Hill”, a high point of the sand dunes. The Park was sand-mined from 1955-73, then filled with solid waste, including garbage and industrial waste.

Southern Cross Drive built across an extensive area of the Lakes course. Any remaining vegetation would have been cleared.

1970’s

Astrolabe Park operations ceased in 1975 and the site was turfed and landscaped in 1978 (Jankowski & Knight 1991).

1980’s

Landfill in Mutch Park ceased in 1986, then the site was capped with “fill materials consisting of sand, gravel, crushed sandstone, shale, ash, glass, bitumen, concrete and brick to a depth of approximately 0.8 metres.” (Georges River Program. Stage 2, Vol.3. April 2003. Technical Paper 5 - Geology and contaminated Land, p.15. Sydney Water, 2003).

Appendix 2. Final Determination for ESBS

Threatened Species Conservation Act 1995 NSW Scientific Committee Final Determination

The Scientific Committee, established by the Threatened Species Conservation Act has made a Final Determination to amend Part 3 of Schedule 1 of the Act (Endangered ecological communities) by listing the Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion as an endangered ecological community and, as a consequence, to omit reference to the Eastern Suburbs Banksia Scrub in Part 3 of Schedule 1 of the Act. Listing of endangered ecological communities is provided for by Part 2 of the Act.

The Scientific Committee has found that:

- a) A Notice of Final Determination to list the Eastern Suburbs Banksia Scrub appeared in the NSW Government Gazette No. 62 on 13th June, 1997. The Scientific Committee considers that an amendment should be made to this listing following the receipt of additional information about the ecological community.
- b) The Eastern Suburbs Banksia Scrub is the accepted name for the ecological community occurring on nutrient poor sand deposits in the Sydney Basin Bioregion.
- c) It has the structural form predominantly of sclerophyllous heath or scrub occasionally with small areas of woodland or low forest, with, depending on local topography and drainage conditions, limited wetter areas.
- d) The Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion is characterised by the following assemblage of species.

<i>Acacia longifolia</i>	<i>Acacia suaveolens</i>	<i>Acacia terminalis</i>
<i>Acacia ulicifolia</i>	<i>Actinotus helianthii</i>	<i>Actinotus minor</i>
<i>Allocasuarina distyla</i>	<i>Astroloma pinifolium</i>	<i>Baeckaea imbricata</i>
<i>Banksia aemula</i>	<i>Banksia ericifolia</i>	<i>Banksia integrifolia</i>
<i>Banksia serrata</i>	<i>Bauera rubioides</i>	<i>Billardiera scandens</i>
<i>Boronia parvifolia</i>	<i>Bossiaea heterophylla</i>	<i>Bossiaea scolopendria</i>
<i>Brachyloma daphnoides</i>	<i>Caustis pentandra</i>	<i>Conospermum taxifolium</i>
<i>Cyathochaeta diandra</i>	<i>Darwinia fascicularis</i>	<i>Darwinia leptantha</i>
<i>Dianella revoluta</i>	<i>Dichelachne crinita</i>	<i>Dillwynia retorta</i>
<i>Epacris longiflora</i>	<i>Epacris microphylla</i>	<i>Epacris obtusifolia</i>
<i>Eragrostis brownii</i>	<i>Eriostemon australasius</i>	<i>Eucalyptus gummifera</i>
<i>Gonocarpus teucroides</i>	<i>Haemodorum planifolium</i>	<i>Hakea teretifolia</i>
<i>Hardenbergia violacea</i>	<i>Hibbertia fasciculata</i>	<i>Hypolaena fastigiata</i>
<i>Kunzea ambigua</i>	<i>Lambertia formosa</i>	<i>Lepidosperma laterale</i>
<i>Leptocarpus tenax</i>	<i>Leptospermum laevigatum</i>	<i>Leptospermum trinervium</i>
<i>Lepyrodia scariosa</i>	<i>Leucopogon ericoides</i>	<i>Lomandra longifolia</i>
<i>Melaleuca nodosa</i>	<i>Melaleuca squamea</i>	<i>Monotoca elliptica</i>
<i>Monotoca scoparia</i>	<i>Persoonia lanceolata</i>	<i>Philotheca salsolifolia</i>
<i>Pimelea linifolia</i>	<i>Pomax umbellata</i>	<i>Pteridium esculentum</i>
<i>Restio fastigiata</i>	<i>Ricinocarpos pinifolius</i>	<i>Styphelia viridis</i>
<i>Woollsia pungens</i>	<i>Xanthorrhoea resinifera</i>	<i>Xanthosia pilosa</i>

- e) The total flora species list for the community may be larger than that given above, with many species present only in one or two sites or in very small quantity. In any particular site, not all of the assemblage listed above may be present. At any one time some species may only be present

as seeds in the soil seed bank with no above ground individuals present. Invertebrate species are poorly known but some species may be restricted to soils or canopy trees and shrubs. The species composition of a site will be influenced by the size of the site and by its recent disturbance history. For a number of years after a major disturbance dominance by a few species (such as *Kunzea ambigua* or *Leptospermum laevigatum*) may occur, with gradual restoration of a more complex floristic composition and vegetation structure over time. The balance between species will change with time since fire, and may also change in response to changes in fire regimes (e.g. fire frequency).

- f) The Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion is distinguished from the coastal heath which occurs along the eastern seaboard on soils derived either directly from sandstone or, if aeolian, of younger age than those of the Eastern Suburbs Banksia Scrub. Coastal heath is characteristically much lower than Eastern Suburbs Banksia Scrub and, although sharing many species with the Eastern Suburbs Banksia Scrub, characteristically contains a more maritime element including *Baeckea imbricata*, *Correa alba* and *Westringia fruticosa*.
Heathland with *Banksia aemula* has been recorded from the Central Coast by Benson & Howell (1994). These stands have a less dense shrub layer, a greater density of graminoids in the ground layer and differences in total floristics when compared with Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion as defined in this determination and are not regarded as part of this community.
- g) The Community has been reported from areas of sand deposits in the local government areas of Botany, Manly, Randwick, Waverley and Woollahra which are all within the Sydney Basin Bioregion. On North Head, within Manly local government area the ecological community occurs on a sand sheet of similar age and composition to that on which the ecological community occurs further south.
- h) The Scientific Committee noted that general information on the Eastern Suburbs Banksia Scrub is provided in Benson D & Howell J 1990. 'Taken for Granted - The Bushland of Sydney and its Suburbs'. Kangaroo Press, Kenthurst.
- i) Less than 1% of the original area of the community currently exists in the form of a number of remnants.
- j) Threats to the survival of the community include fragmentation, development, increased nutrient status, inappropriate fire regimes, invasion by exotic plants, grazing by horses and rabbits, erosion from use of bicycles, motorcycles and from excessive pedestrian use.
- k) Although a small part of the surviving Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion is included within the Botany Bay National Park, this in itself does not ensure the survival of the community unless the threats to the integrity of the community are ameliorated.
- l) In view of the above the Scientific Committee is of the opinion that the Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion is likely to become extinct in nature in New South Wales unless the circumstances and factors threatening its survival cease to operate.

Proposed Gazettal date: 23/08/02
Exhibition period: 23/08/02 – 27/09/02

Reference:

Benson, D. & Howell, J. (1994). The natural vegetation of the Sydney 1:100,000 map sheet. *Cunninghamia* **3(4)**, 679 - 787

Last amended: 23 August 2002:

© Copyright NSW National Parks and Wildlife Service

Appendix 3. Recommended methods for the collection & curation of ESBS seed

See Collection will involve several methods, depending on the species involved, and will include:

- bagging of pollinated (forming) heads
- regular monitoring for seed collection prior to seed drop
- removal of entire seed heads (e.g. Xanthorrhoea)

Appropriate methods for particular species are indicated below

Seed Curation and storage of seed is a particularly important issue. Flower and seed heads of some species are particularly attractive to insects (e.g. Xanthorrhoea) and will be laden with insects and their larvae. These are likely to need fumigation against insects and their eggs.

Seed of some species is best sown fresh while others will require treatment to break the inhibitors (e.g. Monotoca, Persoonia).

Seed of most species will need to be **stored** at low temperature to retain viability.

Improper/inadequate storage & curation will lead to loss of seed (e.g. through predation by hatched larvae) and/or seed viability.

Seed of the following species was collected in late November 2004:

Acacia longifolia/A.sophorae – Several plants in the B1 complex

A.terminalis (planted – seed to be used in landscaping only)

Allocasuarina distyla – from W side of B1

Banksia aemula – B2. (No follicles were collected from the 10/11 plants in B14)

Xanthorrhoea resinifera – several fruiting spikes from various remnants

Bagging

Some species will require bagging of immature fruit heads for collection.

These species include:

Angophora costata, *Eriostemon australasius*, *Leptospermum trinervium*, *Leucopogon ericoides* and *Monotoca elliptica*.

(*Acacia* sp. – but regular monitoring for mature fruit pods will generally make collection easier and more efficient for these)

Other species

The habit and form of some species does readily enable them to be bagged for seed, particularly species of the herb-layer. In these cases, regular monitoring for direct seed collection probably a better method. Examples include the following sources but should be generalised across the remnants:

Native grasses – Spear Grass *Austrostipa pubescens* and Plume Grass *Dichelachne crinita*. These species are rare on the course and are worth collecting for propagation. Plume Grass usually occurs as very small groups or even single plants, often with several culms per plant. It produces large numbers of seed per head and is worth collecting. Spear Grass

Lepidosperma sp. – Common in B2 and adjacent remnants. Cut & collect seed heads.

Lomandra cylindrica – dense 0.4mx0.4m clump in B2. Fruit on short stalks close to ground.

Lomandra glauca – dense matting groundcover in regenerated area in B2 (just S of track)

Platysace ericoides – low sub-shrub.

Seed from other species can be collected at any time from the single Stringybark *Eucalyptus capitellata* in B2; in this regard it is recommended that just a small amount be collected.

Appendix 4. The EPBC Act – Guidelines for the Club

Under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), an action will require approval from the Environment Minister if: the action has, will have, or is likely to have a significant impact on a matter of national environmental significance. The ESBS is listed under the Act as an EEC and is therefore considered to be a matter of national environmental significance.

In the case of the ESBS an action has, will have, or is likely to have a significant impact if it does, will, or is likely to:

- lead to a long-term adverse affect on the ESBS, or
- reduce the extent of the community, or
- fragment an occurrence of the community, or
- adversely affect habitat critical to the survival of the ESBS, or
- modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for the community's survival, or
- result in invasive species that are harmful to the ESBS becoming established in the habitat of the ESBS,*, or
- interfere with the recovery of the ESBS.

(*Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm an EEC by direct competition, modification of habitat, or predation.)

The EPBC Act does not replace the need for the Club to obtain local government approvals such as development approvals. Rather, it requires the Club to also obtain Commonwealth approval if an action is likely to have a significant impact on matters of national environmental significance (such as the ESBS which is listed under the Act as an EEC). If the Club can demonstrate that an action will not have a significant impact on ESBS then the matter does not need to be referred to the Environment Minister for approval.

Further information on the EPBC Act is available at <http://www.deh.gov.au/epbc/>

Appendix 5. The TSC Act 1995 & NPW Act 1974 - Overview and Implications

Overview

To fully understand the implications of having an Endangered Ecological Community (EEC) at Bonnie Doon it is necessary to have some understanding of the *Threatened Species Conservation Act 1995* (TSC Act) and the *National Parks and Wildlife Act 1974* (NPW Act). The following summary gives a background to these Acts highlighting those parts of the Acts which are most relevant for the Club.

Objectives of the TSC Act

The major aim of the TSC Act is to prevent native species, populations and ecological communities from becoming extinct and to secure their recovery.

The Act outlines several objectives including:

- the prevention of extinction and promotion of the recovery of threatened species, populations, and ecological communities;
- the elimination or management of threatening processes;
- protection of habitat critical to the survival of threatened species, populations and ecological communities;
- ensuring that the impact of any action affecting threatened species, populations and ecological communities is properly assessed; and
- encouraging the conservation of threatened species, populations and ecological communities by the adoption of measures involving cooperative management.

Threatened species, populations and ecological communities are listed in 'schedules' under the Act.

Who administers the TSC and NPW Acts?

The Department of Environment and Conservation (DEC), formerly NPWS, principally administer these Acts.

What is an endangered ecological community?

An Endangered Ecological Community is an assemblage of species occupying a particular area which is likely to become extinct, or is in immediate danger of becoming extinct. Eastern Suburbs Banksia Scrub (ESBS) is listed under the TSC Act as an Endangered Ecological Community (EEC).

Final Determination

The NSW Scientific Committee makes a final determination regarding threatened species, populations and ecological communities, and they are then gazetted. The Final Determination is understood to be the legal definition of the species, population or ecological community. In the case of a community, a list of characteristic species is included in the Final Determination.

The Final Determination for the ESBS is provided in Appendix 2. The species present in ESBS are not limited to the list included in the Final Determination, nor do all species need to be present for the community to be described as ESBS. The ESBS is named after the Wallum Banksia (*Banksia aemula*). Although several species of Banksia occur in the community, particular remnants may not contain any of these species; Banksia does not need to be present for the vegetation to qualify as ESBS (Sauveterre, 1997).

Recovery Plans

Once a species, population or community has been listed as threatened, the DEC is required to prepare a recovery plan. The recovery plan includes measures to address the threats to the survival

of the species, population or community. It focuses on the actions required to help a species, population or community recover.

Recovery plans must be taken into account by councils and public authorities when providing approval for developments and activities, if the species, population or community is found within the vicinity of the proposed activity or is likely to be affected.

An approved Recovery Plan for the ESBS was completed and published in February 2004.

Offences - *What the Club must therefore NOT DO*

Offences relating to Endangered Ecological Communities, such as the ESBS, are laid out in Sections 118A and 118D of the NPW Act 1974. A full extracts of these offences and associated penalties is provided in Appendix 5. In summary, the Club must not:

‘HARM’ any native animal that occurs in the ESBS. This includes hunt, shoot, poison, net, snare, spear, pursue, capture, trap, injure or kill.

‘PICK’ any native plant within the ESBS. This means gather, pluck, cut, pull up, destroy, poison, take, dig up, remove, injure the plant or any part of the plant.

‘DAMAGE’ the ESBS. This means cause injury or harm that impairs its value or usefulness. This includes the plants, animals, soils or any other organism.

Penalties

Severe penalties exist for picking, damaging or causing harm to an Endangered Ecological Community, such as the ESBS. These penalties are laid out in the NPW Act 1974. A full extract is provided in Appendix 6.

It is a defence to a prosecution for an offence if the accused proves that the action was authorised to be done, and was done in accordance with a scientific licence under section 132C of the NPW Act 1974, or was the subject of a certificate issued under Section 95 (2) of the TSC Act 1995.

Licencing Requirements

Prior to October 2003, it was necessary for the Club to apply for a licence under Section 91 of the TSC Act in order to carry out any actions that would constitute a pick, harm, or cause damage to the ESBS (this included any bush regeneration activities). A full extract of Section 91 of the TSC Act is provided in Appendix 9.

In response to an application for a Section 91 Licence the Club was issued with a Section 95(2) Certificate on the 4th of February 2000. A copy of this certificate and associated letter of conditions, issued by the then NPWS, is given in Appendix 10.

Since October 2003, all actions (such as bush regeneration) for the purposes of research, education or conservation (ie protection and enhancement of the ESBS) involving Endangered Ecological Communities such as the ESBS require a licence issued under Section 132C of the *NSW National Parks and Wildlife Act 1974*. A full extract of Section 132 C of the NPW Act is provided in Appendix 11.

BDGC was issued with its first 132C Scientific Licence in May 2004. A copy of this licence is given in Appendix 12. The Club is required to satisfy all conditions associated with the licence.

Appendix 6. NPW Act 1974 - Offences and penalties

National Parks and Wildlife Act 1974 No 80

118A - Harming or picking threatened species, endangered populations or endangered ecological communities

(1) A person must not:

- (a) harm any animal that is of, or is part of, a threatened species, an endangered population or an endangered ecological community, or
- (b) use any substance, animal, firearm, explosive, net, trap, hunting device or instrument or means whatever for the purpose of harming any such animal.

Penalty:

- (a) in respect of any endangered species, population or ecological community **2,000 penalty units or imprisonment for 2 years or both**, and, in a case where an animal of any endangered species, population or ecological community is harmed, an additional **100 penalty units** in respect of each animal that is harmed,
- (b) in respect of any vulnerable species—500 penalty units or imprisonment for 1 year or both, and, in a case where an animal of any vulnerable species is harmed, an additional 50 penalty units in respect of each animal that is harmed.

(2) A person must not pick any plant that is of, or is part of, a threatened species, an endangered population or an endangered ecological community.

Penalty:

- (a) in respect of any endangered species, population or ecological community **2,000 penalty units or imprisonment for 2 years or both**, and an additional **100 penalty units** in respect of each whole plant that was affected by or concerned in the action that constituted the offence,
- (b) in respect of any vulnerable species—500 penalty units or imprisonment for 1 year or both, and an additional 50 penalty units in respect of each whole plant that was affected by or concerned in the action that constituted the offence.

(3) It is a defence to a prosecution for an offence against this section if the accused proves that the act constituting the alleged offence:

- (a) was authorised to be done, and was done in accordance with, a general licence under section 120, a licence under section 131, 132 or 132A, a scientific licence under section 132C or a licence granted under Part 6 of the *Threatened Species Conservation Act 1995* , or
- (a1) was the subject of a certificate issued under section 95 (2) of the *Threatened Species Conservation Act 1995* , or
- (b) was essential for the carrying out of:
 - (i) development in accordance with a development consent within the meaning of the *Environmental Planning and Assessment Act 1979* , or
 - (ii) an activity by a determining authority within the meaning of Part 5 of that Act if the determining authority has complied with that Part, or
 - (iii) an activity in accordance with an approval of a determining authority within the meaning of Part 5 of that Act if the determining authority has complied with that Part, or
- (b1) was authorised by, and done in accordance with, a conservation agreement, or
- (b2) was authorised by, and done in accordance with, a joint management agreement entered into under Part 7 of the *Threatened Species Conservation Act 1995* , or
- (c) was authorised to be done by or under the *State Emergency and Rescue Management Act 1989* or the *State Emergency Service Act 1989* and was reasonably necessary in order to avoid a threat to life or property, or
- (d) was not done for commercial purposes and was done in relation to a plant that was cultivated by the person as a hobby or was cultivated by another person as a hobby, or

- (e) was done in relation to a plant that was obtained from a person who was authorised to grow and sell it by a licence issued under section 132.
- (3A) This section does not apply in relation to any thing authorised to be done by or under the *Rural Fires Act 1997* in relation to any emergency fire fighting act within the meaning of that Act.
- (4) If the provisions of any other Act or law or of any instrument made under any other Act or law authorise or require anything to be done that would constitute an offence under this section:
 - (a) this section prevails (except in relation to a matter referred to in subsection (3) (b) or (c)), and
 - (b) a person is not to be convicted of an offence against the other Act, law or instrument because of the person's failure to comply with the other Act, law or instrument if compliance with the other Act, law or instrument would constitute an offence under this section.

118D - Damage habitat of threatened species, endangered population or endangered ecological community

- 1) A person must not, by an act or an omission, do anything that causes damage to any habitat (other than a critical habitat) of a threatened species, an endangered population or an endangered ecological community if the person knows that the land concerned is habitat of that kind.
Penalty: 1,000 penalty units or imprisonment for 1 year or both.
- 2) It is a defence to a prosecution for an offence against this section if the accused proves that the act constituting the offence:
 - (a) was authorised to be done, and was done in accordance with, a licence granted under this Act or under Part 6 of the *Threatened Species Conservation Act 1995* , or
 - (a1) was the subject of a certificate issued under section 95 (2) of the *Threatened Species Conservation Act 1995* , or
 - (b) was essential for the carrying out of:
 - (i) development in accordance with a development consent within the meaning of the *Environmental Planning and Assessment Act 1979* , or
 - (ii) an activity by a determining authority within the meaning of Part 5 of that Act if the determining authority has complied with that Part, or
 - (iii) an activity in accordance with an approval of a determining authority within the meaning of Part 5 of that Act if the determining authority has complied with that Part, or
 - (c) was authorised to be done by or under the *State Emergency and Rescue Management Act 1989* or the *State Emergency Service Act 1989* and was reasonably necessary in order to avoid a threat to life or property, or
 - (d) was authorised by, and done in accordance with, a conservation agreement, or
 - (e) was authorised by, and done in accordance with, a joint management agreement entered into under Part 7 of the *Threatened Species Conservation Act 1995* .
- 3A) This section does not apply in relation to any thing authorised to be done by or under the *Rural Fires Act 1997* in relation to any emergency fire fighting act within the meaning of that Act.
- 3) If the provisions of any other Act or law or of any instrument made under any other Act or law authorise or require anything to be done that would constitute an offence under this section:
 - (a) this section prevails (except in relation to a matter referred to in subsection (2) (b) or (c)), and
 - (b) a person is not to be convicted of an offence against the other Act, law or instrument because of the person's failure to comply with the other Act, law or instrument if compliance with the other Act, law or instrument would constitute an offence under this section.

118E - Court may order offender to restore habitat

- 1) If a court convicts a person of an offence under this Part involving damage to any critical habitat or habitat of a threatened species, an endangered population or an endangered ecological community, the court may, in addition to or in substitution for any pecuniary penalty for the offence, direct the person to take any action to mitigate the damage or to restore that critical habitat or habitat.
- 2) The court may specify the actions to be taken to mitigate the damage or restore the habitat and may order the person to maintain the habitat until the actions ordered to be done to mitigate the damage or restore the habitat have been fully performed.
- 3) The court may order the person to provide security for the performance of any obligation

imposed under this section.

- 4) For the purposes of this section, a conviction includes the making of an order under section 10 of the Crimes (Sentencing Procedure) Act 1999.

Note on the Penalty Unit

The current value (as of September 2004) of the **penalty unit** is \$110. The monetary value of penalty can be obtained by multiplying the number of **penalty units** by \$110.

Appendix 7. The POEO Act - Overview and Implications

Section 120 of the Act states that a person must not

- (1) pollute any waters
- (2) cause any waters to be polluted
- (3) permit any waters to be polluted.

Waters are defined as:

(i) any dry bed of any water, or into any drain, channel or gutter used, or is designed to receive or pass rainwater, floodwater or (ii) any other water that is not polluted.

Water pollution is defined as the placing of any matter (whether solid, liquid, or gaseous) in a position where it (i) falls, descends, is washed, is blown or percolates, or (ii) is likely to do the same into any waters.

Severe penalties exist under the POEO Act for pollution of waters. Penalties range from on-the-spot fines of \$750 for individuals and \$1,500 for corporations through to penalties imposed by the courts of up to \$250,000. In addition there are a number of notices which can be issued which require action to be taken to clean up or prevent pollution.

Given the proximity of the golf course to The Botany Wetlands and the underlying Botany Aquifer it is crucial that the Club take care when carrying out any activities that may contribute to the pollution of these waters (ground or surface water). The Club is required to obtain a licence to carry out any activity referred to under the Act as a 'non-scheduled activity' that has potential to cause water pollution.

Appendix 8. The Pesticides Act 1999 - Offences and Penalties

Under the Pesticides Act 1999 it is an offence to use a pesticide in a way that causes:

- injury or likely injury to another person,
- damage or likely damage to another person's property, or
- harm to a non-target plant or animal.

The maximum penalties for these offences are \$60,000 for an individual, and \$120,000 for a corporation. A defence against prosecution is provided where a person takes all reasonable precautions and exercises due diligence when using a pesticide, and the offence occurs due to factors over which the person had no direct control. *Due diligence means taking steps to determine all the risks involved in using a pesticide and taking appropriate action to avoid and minimise those risks.*

The Pesticides Act also sets out a number of higher penalties for people who *wilfully or negligently* misuse pesticides causing injury, death or harm. Examples of these offences are:

- wilfully or negligently using a pesticide to cause harm to a non-target animal or non-target plant, and
- wilfully or negligently using a pesticide in a manner which causes material harm to an animal that is a threatened species within the meaning of the Threatened Species Conservation Act 1995 or that is protected fauna within the meaning of the National Parks and Wildlife Act 1974.

The penalty for these offences is a fine of up to \$250,000 for a corporation, and a fine of up to \$120,000 for an individual. The EPA may issue penalty notices ('on the spot' fines) for up to \$1,500 for minor offences under the Pesticides Act.

Appendix 9. Section 91 License – TSC Act 1995 No 101

91 - Licence to harm or pick threatened species, populations or ecological communities or damage habitat

(1) The Director-General may grant a licence authorising a person to take action likely to result in one or more of the following:

- (a) harm to any animal that is of, or is part of, a threatened species, population or ecological community,
- (b) the picking of any plant that is of, or is part of, a threatened species, population or ecological community,
- (c) damage to critical habitat,
- (d) damage to habitat of a threatened species, population or ecological community.

(2) A general licence may be issued under section 120 of the *National Parks and Wildlife Act 1974* to authorise an action referred to in subsection (1) only:

- (a) or the welfare of an animal, or
- (b) if there is a threat to life or property.

(3) Subsection (2) does not limit the purposes for which a licence may be issued under this section.

Note. For example, a licence may be issued under this section to authorise an Aboriginal person or persons to harm animals or pick plants for cultural purposes.

95 Determination by Director-General as to significant effect

(1) If the Director-General determines that an action proposed by an applicant for a licence is likely to significantly affect threatened species, populations or ecological communities, or their habitats, the Director-General must notify the applicant that, if the application is to proceed, a species impact statement prepared in accordance with Division 2 must be provided.

(2) If the Director-General determines that an action proposed is not likely to significantly affect threatened species, populations or ecological communities, or their habitats, a licence under this Act is not required and the Director-General must, as soon as practicable after making the determination, issue to the applicant a certificate to that effect.

Note. An action that is not required to be licensed under this Act may however be required to be licensed under the *National Parks and Wildlife Act 1974* if it is likely to affect protected fauna or protected native plants or may otherwise constitute an offence under that Act.

As indicated above, The TSC Act 1995 made provision for the issue of a Section 95(2) Certificate for actions which technically constitute a 'pick' of a threatened species, populations or ecological communities but are determined as unlikely to have a significant impact. Such certificates serve the same legal function as a licence.

Appendix 10. Section 95(2) Certificate & Letter of Conditions



NSW
NATIONAL
PARKS AND
WILDLIFE
SERVICE

THREATENED SPECIES CONSERVATION ACT 1995

SECTION 95(2) CERTIFICATE

Certificate No.: SYZ/00/02

Issued: 4 February 2000

Expires: 31 June 2007

Issued to:

Noel Simmons and those acting
under his direction
Bonnie Doon Golf Club
Banks Avenue
Pagewood NSW 2035

I certify that the proposed bushland regeneration activities on the Bonnie Doon Golf Course, Pagewood on the known remnants of Eastern Suburbs Banksia Scrub have been determined under Section 94(2) of the *Threatened Species Conservation Act 1995* as unlikely to significantly affect threatened species, populations, ecological communities or their habitats and consequently the proposal does not require a licence under the *Threatened Species Conservation Act, 1995* pursuant to Section 95(2).

This certificate is a defence against prosecution under sections 118A-D of the *National Parks and Wildlife Act 1974*.

Robert Humphries
Manager, Threatened Species Unit
SYDNEY ZONE

43 Bridge Street
PO Box 1967
Hurstville NSW
2220 Australia
Tel: (02) 9545 6444
Fax: (02) 9545 6555
www.npws.nsw.gov.au

Australian-made 100% recycled paper



NSW
NATIONAL
PARKS AND
WILDLIFE
SERVICE

Noel Simmons
General Manager
Bonnie Doon Golf Club
Banks Avenue
PAGEWOOD NSW 2035

your ref:
our ref: 97/211

Dear Mr Marsden

Re: Section 91 licence application for bush regeneration activities

I refer to your section 91 licence application to conduct bush regeneration activities on remnants of Eastern Suburbs Banksia Scrub (ESBS) occurring on the Bonnie Doon Golf Course.

I have assessed your licence application in accordance with the provisions of the *Threatened Species Conservation Act 1995* (TSC Act) and concluded that the proposal is unlikely to have a significant impact on threatened species, endangered populations or endangered ecological communities. The TSC Act makes provision for the issue of a certificate for actions which technically constitute a 'pick' of a threatened species, but are unlikely to have a significant impact. Such certificates serve the same legal function as a licence. Accordingly, I have decided to authorise your bush regeneration activities and issue you a certificate.

The decision that the bush regeneration activities are unlikely to have a significant impact is based on you ensuring that the following conditions are met

1. all bush regeneration works are performed or supervised by a fully trained and experienced co-ordinator who has completed the Certificate of Bushland Regeneration (or equivalent); and
2. all bush regeneration works are carried out in accord with the Guidelines (section 6) set out in the Landscape and Environment Plan 1997-2007 for the Bonnie Doon Golf Club, October 1998.
3. all weed removal and native plant regeneration will be staged to avoid impacts on fauna;
4. results of the works will be reported to the ESBS Recovery Team and a brief annual progress report will be submitted to Recovery Team members advising of the results of the project.

43 Bridge Street
PO Box 1967
Hurstville NSW
2220 Australia
Tel: (02) 9585 6444
Fax: (02) 9585 6555
www.npws.nsw.gov.au

Australian-made 100% recycled paper

Bush regeneration activities that involve broader and more detailed objectives/actions (for example, translocation of threatened species and/or reconstruction of ecological communities) require a higher level of assessment by the National Parks and Wildlife Service (NPWS) and have not been authorised by this certificate. The NPWS considers that these objectives are generally best considered and dealt with through the recovery planning process.

Please find attached a certificate issued under section 95(2) of the TSC Act. If you have any questions about this matter, please contact Phil Glass, Threatened Species Officer on (02) 9585 6619.

Yours sincerely

 4/2/2000

Definitions

“threatened species, populations and ecological communities” means species, populations and ecological communities specified in Schedules 1 and 2 of the *Threatened Species Conservation Act 1995* and threatened species, population or ecological community *means* a species, population or ecological community specified in either of those Schedules.

Appendix 11. Section 132c License - NPW Act 1974 No 80

132C - Scientific licences

(1) An authorised officer may issue a licence (in this Act referred to as a *scientific licence*) authorising a person to take action, for scientific, educational or conservation purposes, that is likely to result in one or more of the following:

- (a) harm to any protected fauna, or to an animal that is of, or is part of, a threatened species, an endangered population or an endangered ecological community,
- (b) the picking of any protected native plant or of any plant that is of, or is part of, a threatened species, an endangered population or an endangered ecological community,
- (c) damage to critical habitat,
- (d) damage to a habitat of a threatened species, an endangered population or an endangered ecological community.

(2) A scientific licence does not, except in so far as the terms of the licence otherwise expressly provide, authorise the harming of fauna in a national park, historic site, state conservation area, regional park, karst conservation reserve, nature reserve, Aboriginal area, wildlife refuge, conservation area, wilderness area or area subject to a wilderness protection agreement.

(3) A scientific licence may be issued without conditions or limitations or may be issued subject to specified conditions or limitations.

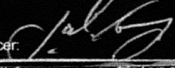
(4) In particular:

- (a) a scientific licence may but need not specify the animal or plant that may be harmed or picked under its authority, and
- (b) a scientific licence may but need not be limited to specified areas.

(5) A scientific licence may authorise any specified persons, or class of persons, in addition to the person to whom the licence is issued to do the things authorised by the licence. In such a case, the specified persons or class of persons are taken to be holders of the licence for the purposes of this Act.

(6) To avoid doubt, the Director-General is not a determining authority for the purposes of Part 5 of the *Environmental Planning and Assessment Act 1979* when issuing a scientific licence.

Appendix 12. The Club's Section 132C Scientific Licence

Scientific Licence Section 132C, NPW Act 1974				The licensee is authorised to : Pick, conduct bush regeneration activities, collect and propagate native plants in the following areas : - Bonnie Doon Golf Course only	
Mr David SCAIFE Bonnie Doon Golf Club Banks Avenue Pagewood NSW 2035				in conjunction with the project, subject to the conditions contained in the application form and the following conditions : No replanting within 20m of a known locality of a threatened species or within the habitat of a threatened species. No seed collection of species listed under the NSW TSC Act 1995. Bush regeneration activities to be undertaken by suitably qualified and experienced persons or under their direct supervision. Also authorised, Jeremy Gray, Nicki Huang, Calliope Adamos and Ben Marsden	
Licence Number: S11204 Expires: 31-Mar-2005 Project: Protection and Enhancement of Eastern Suburbs Banksia Scrub on Bonnie Doon Golf Course				Signature of Licensee:  Date: 24.5.2004	
Authorised Officer:  Date: 30 APR 2004					
X cut along the box X		X cut along the box X		X cut along the box X	

This is your licence under the *National Parks and Wildlife Act 1974* issued subject to the following conditions and including conditions as per the licence and application form:

Fauna Licences

1. This licence authorises you to undertake research on the specified fauna. However, it is your responsibility to also ascertain whether you have responsibilities to meet with respect to licensing under the Animal Research Act. This legislation is administered by the Animal Welfare Branch, NSW Agriculture – phone 02 6391 3670.

Flora Licences

2. This licence may authorise you to collect threatened species of flora listed under Schedule 1 & 2 of the *Threatened Species Conservation Act 1995*, solely for scientific, educational or conservation purposes.

Combined fauna and flora licences
 Conditions 1 & 2 apply

Instructions for sealing the licence
 Please check that the details on your attached Scientific Licence are correct and then sign and date.

Cut along the boxed border and place the card centrally within the plastic envelope, wrap it completely with aluminium foil and then gently rub a moderately warm iron over the foil. If the iron is too hot or you continue to iron for too long the plastic will MELT rather than seal around the edges so you are advised to be careful!! Replacement plastic envelopes are available should you reduce this one to a molten. Condition - An unsigned, undated or unsealed licence will not be accepted as valid.

Mr David SCAIFE
 Bonnie Doon Golf Club
 Banks Avenue
 Pagewood NSW 2035

Appendix 13. Plant species used for fenceline plantings between 2000 and 2004

List compiled by the Club Horticulturalist (2000-04) Ben Marsden

PLANT SPECIES USED FOR FENCELINE PLANTINGS

These plants are from the Eastern Suburbs Banksia Scrub and endangered ecosystem.

Acacia longifolia

Acacia suaveolens

Acacia terminalis

Allocasuarina distylia

Banksia ameula

Banksia serrata

Banksia ericifolia

Lambertia formosa

Backea imbricata

Leptospermum laevigatum

Grevillea speciosa

Appendix 14. Plant Schedule

This plant schedule lists plants suitable for use on Bonnie Doon Golf Course. The list has been compiled using the final determination for the ESBS, previous surveys of the ESBS undertaken at the Course, and the Botany Council ESBS species lists. Species not suitable for planting at Bonnie Doon have not been included.

The list is divided into four separate tables covering:

- Indigenous trees;
- Indigenous shrubs;
- Indigenous grasses and groundcovers; and
- Vines.

Plant characteristics that make certain plants suitable for growing in particular places are identified. (Where evident they are noted under the 'Comments' column).

Specific plant characteristics include:

- Dense foliage (provide good habitat for ground-dwelling fauna such as lizards)
- Spikey foliage (good for native birds)
- Wet places (plants that can tolerate temporarily wet soils)
- Ball strike (plants with thick bark and/or foliage that can tolerate ball-strike)

Four different zones have been distinguished to further help the Club select plants best suited to different areas of the golf course. These are:

- Between fairways and holes;
- Landscaping – planting beds adjacent to tees, greens and paths (lower shrubs);
- Fencelines – plus adjacent to roadways and maintenance areas; and
- ESBS remnants.

All of the plants that are listed on this schedule are local native plants, those that are indigenous to the Eastern Suburbs Banksia Scrub Community. This choice is made because:

- It fulfils the conditions of the Club's 132C Scientific Licence;
- It fulfils the lease conditions set by Sydney Water;
- Indigenous plants from the ESBS community are most likely to thrive in the soils and conditions present at Bonnie Doon;
- The character of these plants fulfils the aim of developing a more links style course;
- These plants provide important habitat for local native birds, insects and other fauna especially when planted densely and left undisturbed;
- They can (in most cases) be collected and grown by local nurseries, which specialise in indigenous species.

KEY

Present in ESBS remnants - Based upon the survey undertaken by Hirschfeld 1998

* Present in only 1 remnant at Bonnie Doon

** Present in more than 1 remnant at Bonnie Doon

FD – Final Determination for the ESBS issued by the NSW Scientific Committee under the Threatened Species Conservation Act 1995

Yes – indicates that the species is listed on the Final Determination for the ESBS

TREES								
Species	Present in ESBS remnants	Listed in FD	Common Name	Comments	Suitable for planting:			
					Between fairways and holes	In Landscaped areas	Along Fencelines	In or adjacent to the ESBS
<i>Angophora costata</i>	**		Smooth-barked Apple, Sydney Red Gum	Present in several remnants across the golf course. Plantings need to be sourced from coastal (preferably heathland) sources to retain a low woodland form on the site	√	√	√	√
<i>Banksia aemula</i>	**	Yes	Banksia	Coarse foliage; spreading tall shrub; similar to <i>B. serrata</i> ; flowers autumn-winter. Plant in preference to <i>B. integrifolia</i> and <i>B. serrata</i> wherever possible.	√	√	√	√
<i>Banksia integrifolia</i>		Yes	Coast Banksia	Plant <i>B. aemula</i> in preference to this species wherever possible. May not have been part of original ESBS on this site. Tree to 15m; yellow flower spikes; flowers summer/autumn.	√	√	√	
<i>Corymbia gummifera</i> (syn. <i>Eucalyptus gummifera</i>)	*	Yes	Red Bloodwood	Tree, often < 10m. Should be used widely across the site.	√	√	√	√
<i>Eucalyptus capitellata</i>		No	Stringybark	Small tree, usually <10m. Plantings must be of local provenance. On-site seed source is available.	√	√	√	√
<i>Monotoca elliptica</i>	**	Yes	Tree Broom-heath	Large shrub/small tree; dense foliage. Recommended for propagation and planting.	√	√	√	√

<i>Hakea dactyloides</i>			Broad-leaved Hakea	Shrub or small tree, to 5-6m. Has been found in several ESBS remnants within 10km of the site.	√	√	√	√
<i>Allocasuarina littoralis</i>			Black She-oak	Not actually part of the ESBS. May be used in landscaping, but preference should always be given to ESBS species.		√		
<i>Eucalyptus globoidea</i>			White Stringy Bark	A small number of this species already planted on fairways. Plant <i>E.capitellata</i> in preference.		√		
<i>Eucalyptus piperita</i>			Sydney Peppermint	Planted on fairways. Other ESBS canopy species are preferred.		√		
<i>Eucalyptus robusta</i>			Swamp Mahogany	Spreading tree to 20m, minimal use only recommended on the site.		√		
<i>Ficus rubiginosa</i>			Port Jackson Fig	This becomes very large and should only be use if adequate space is available. Use ESBS species in preference to this.		√		
<i>Melaleuca linariifolia</i>			Snow-in-summer			√		

SHRUBS								
Species	Present in ESBS remnants	Listed in FD	Common Name	Comments	Where to Plant			
					Between fairways and holes	In Landscaped areas Only	Along Fencelines	In or adjacent to the ESBS
<i>Acacia sophorae</i> (syn <i>A. longifolia</i> var. <i>sophorae</i>)	**	Yes	Golden Wattle	Dense foliage, ball strike. 1-2m x 4m; good dune stabiliser; its spreading decumbent branches cover the sand. Use for initial quick cover, has a short lifespan but is easily replaceable.	√	√	√	√
<i>Acacia suaveolens</i>	**	Yes	Sweet-scented Wattle	Open small shrub; cream flowers, flowers autumn/winter	√	√	√	√
<i>Acacia terminalis</i>		Yes	Sunshine Wattle	Best grown from seed	√	√	√	√
<i>Acacia ulicifolia</i>	*	Yes	Prickly Moses	Best grown from seed	√	√	√	√
<i>Allocasuarina distyla</i>	**	Yes	Scrub She-oak	Dense foliage, ball strike. Medium-large. shrub to 3m; pendulous branchlets	√	√	√	√
<i>Allocasuarina</i> sp. aff. <i>diminuta</i>				Shrub to 1.5m; erect branches; locally uncommon. Use <i>A. distyla</i> in preference to this species as it already occurs within remnants on the site.	√	√	√	√
<i>Astroloma pinifolium</i>	*	Yes	Pine Heath	Neat, compact shrub to 1m; tubular flowers in winter; attractive foliage.	√	√	√	√
<i>Baeckea imbricata</i>		Yes	Heath-myrtle	Dense foliage, wet areas. Shrub to 600mm; crowded leaves; white flowers in autumn		√		
<i>Banksia ericifolia</i>		Yes	Heath Banksia	Dense foliage, ball strike, wet areas. Shrub to 4x4m; red flowers in winter; attractive to birds		√		

<i>Banksia serrata</i>		Yes	Old Man Banksia	Dense, coarse foliage; spreading tall shrub 3-4m; flowers autumn-winter. Preference should be given to planting <i>B. aemula</i>. especially in/near ESBS remnants.	√	√	√	√
<i>Banksia paludosa</i>	*		Swamp Banksia	Medium spreading shrub 1.5mH x 1.5mW with elliptical leaves, green above, silver below. Pale yellow to brownish flowerheads. Propagation from seed or cuttings is considered to be relatively easy.		√	√	√
<i>Boronia parviflora</i>		Yes	Swamp Boronia	Small sub-shrub. Requires moist habitat.		√	√	√
<i>Boronia rigens</i>			Stiff Boronia	Small rigid sub-shrub. Prefers dry habitats.		√	√	
<i>Bossiaea heterophylla</i>	**	Yes	‘Pea’ flower	Variable < 1m, attractive when flowering, nitrogen-fixing	√	√	√	√
<i>Bossiaea scolopendria</i>	*?	Yes		Sub-shrub, herb layer	√	√	√	√
<i>Brachyloma daphnoides</i>	**	Yes	Daphne Heath	1m shrub with small pungent leaves	√	√	√	√
<i>Breynia oblongifolia</i>			Breynia	Slender shrub to 2m or less. Occurs in several remnants within 10km of the site.	√	√	√	√
<i>Callistemon citrinus</i>			Crimson Bottlebrush	Requires moist habitat. Plant <i>C. linearis</i> in preference to this one.		√		
<i>Callistemon linearis</i>				Requires moist habitat.		√	√	√
<i>Caustis petandra</i>	**	Yes		Erect sedge 1-2m tall, lime-green foliage. Has an attractive habit/form	√	√	√	√
<i>Ceratopetalum gummiferum</i>			Christmas Bush	Dense foliage. Not ESBS, small tree, good as a landscape plant. (Non cultivated forms).		√		
<i>Chelianthes sieberi</i> subsp. <i>sieberi</i>			Mulga Fern	Small fern with dark green fronds.	√	√	√	√

<i>Darwinia fascicularis</i> (ssp. <i>fascicularis</i>)		Yes	Darwinia	Multi-branching shrub to about 1m. Recommended for planting where suitable habitat occurs on site.			√	√
<i>Darwinia leptantha</i>		Yes	Darwinia	Small upright shrub to 80cm. Recommended for planting where suitable habitat occurs on site.			√	√
<i>Dillwynia glaberrima</i>	*		Smooth Parrot-pea	Medium shrub 1-2m high, 1-2 m wide Bright yellow and red flowers appear Aug-Dec.	√	√	√	√
<i>Epacris microphylla</i>		Yes	Coral Heath	Small shrub to ~1m, small 'star' flowers	√	√	√	√
<i>Epacris obustifolia</i>		Yes	Blunt-leaf Heath	Recommended for planting where suitable habitat occurs on site.	√	√	√	√
<i>Eriostemon australasius</i>	**	Yes	Pink Wax-flower	Shrub to ~1m, attractive flowers 15cm.diam	√	√	√	√
<i>Gompholobium glabratum</i>	*		Wedge Pea	Decumbent or ascending shrub, 5-40 cm high, Flowers yellow; appear August to November;		√	√	√
<i>Grevillea speciosa</i>				Plant in elevated drier areas only		√		
<i>Hakea gibbosa</i>				Dense, spiky foliage. Plant in elevated, drier areas only		√		
<i>Hakea teretifolia</i>		Yes	Dagger Hakea	Dense 'spiky' foliage, wet areas. Shrub to 2m Plant only where suitable habitat occurs on site (higher moisture content).	√	√	√	√
<i>Hibbertia fasciculata</i>	**	Yes		A low erect sub-shrub to 30cm high	√	√	√	√
<i>Hibbertia linearis</i>	*				√	√	√	√
<i>Hibbertia obtusifolia</i>				Variable shrub < 1m, multi-stemmed.		√		
<i>Kunzea ambigua</i>		Yes	Tickbush	Dense shrub. Recommended for planting where suitable habitat occurs on site.	√	√	√	√

<i>Leptospermum arachnoides</i>			Tea-tree	Recommended for planting only where suitable habitat occurs on site (prefers shallow soils).	√	√	√	√
<i>Leptospermum laevigatum</i>	**	Yes	Coastal Tea-tree	Dense foliage, ball strike. Minimise plantings into ESBS – use other shrubs where possible.	√	√	√	√
<i>Leptospermum polygalifolium</i>			Lemon-scented Tea-tree	Dense foliage, ball strike, wet areas.		√		
<i>Leptospermum trinervium</i> (syn. <i>Leptospermum attenuatum</i>)	**	Yes	Flaky-barked Tea-tree	Shrub 2-4m, flaky bark, fine foliage. Flowers white Propagation is from seed or cuttings. Seed is not retained on the shrub and will need to be collected by bagging	√	√	√	√
<i>Leucopogon ericoides</i>	**	Yes	Bearded Heath	Slender and erect prickly shrub, usually about 0.5 - 1.5m high, sometimes low and almost prostrate.	√	√	√	√
<i>Melaleuca amillaris</i>			Occurs in several remnants within 10km of the site	Dense foliage, ball strike, wet areas. Large, rounded shrub to 5m. Plant only as part of mixed shrub plantings. Minimise plantings into ESBS.	√	√	√	
<i>Melaleuca ericifolia</i>			Swamp paperbark	Wet areas. Only if planted in suitable habitat, eg moist depressions.	√	√	√	√
<i>Melaleuca nodosa</i>	*	Yes		Spiky foliage, wet areas Small stiff spiky shrub	√	√	√	√
<i>Melaleuca squamea</i>		Yes	Swamp Honeymyrtle	Wet areas. Recommended for planting where suitable habitat occurs on site (elevated moisture content).	√	√	√	√
<i>Monotoca scoparia</i>		Yes	Prickly Broom-heath	Shrub to ~1m, pointed leaves	√	√	√	√
<i>Persoonia lanceolata</i>	**	Yes	Lance-leaf Geebung	Rounded shrub to ~2.2m or less, fleshy fruit, attractive lime-green foliage. Can be difficult to propagate	√	√	√	√

<i>Petrophile pulchella</i>	*			Medium shrub, yellow flowers. Propagate by seed. Plant in drier, elevated areas.	√	√	√	√
<i>Philotheca salsolifolia</i>		Yes	Philotheca	Sub-shrub/shrub 1-2m, aromatic foliage	√	√	√	√
<i>Pimelia linifolia</i>	*	Yes	Slender Rice Flower	Shrub to 1m	√	√	√	√
<i>Pteridium esculentum</i>		Yes	Bracken fern	Tough fern to 1-1.5m, often less	√		√	√
<i>Ricinocarpos pinifolius</i>	*	Yes	Wedding Bush	Shrub 1-1.5m, attractive white flowers and ball-like fruit	√	√	√	√
<i>Styphelia viridis</i>		Yes	Green Five-corners	Shrub to <1m, pointed leaves, attractive tubular flowers (bird pollinated)	√	√	√	√
<i>Viminaria juncea</i>			Has been found within other ESBS remnants within 10km of Bonnie Doon.	Recommended for planting where suitable habitat occurs on site (elevated moisture content).	√			
<i>Westringia fruticosa</i>			Coastal Rosemary	Usually a maritime species.		√		
<i>Woollsia pungens</i>	**	Yes	Woollsia	Few-stemmed 'shrub' 1.5-2m, often contorted, attractive 'star' flowers. Flowers attract insects which are required for pollination	√	√	√	√
<i>Xanthorrhoea resinifera</i> (syn. <i>resinosa</i>)	**	Yes	Grass Tree (underground stem)	Single-stemmed 'grass-tree', forms 'skirt' on old plants; insect pollinators. Potential seed source on site (Prolific flowering in 2004).	√	√	√	√

GRASSES & GROUNDCOVERS								
Species	Present in ESBS remnants	Listed in FD	Common Name	Comments	Where to Plant			
					Between fairways and holes	In Landscaped areas Only	Along Fencelines	In or adjacent to the ESBS
<i>Actinotus helianthii</i>		Yes	Flannel Flower	Uncommon in remnants but should be used in herb-layer/groundcover plantings	√	√	√	√
<i>Actinotus minor</i>		Yes	Lessor Flannel Flower		√	√	√	√
<i>Bauera rubroides</i>		Yes	River Rose	Recommended for planting where suitable habitat occurs on site (elevated moisture content).		√		√
<i>Carex</i> sp.				Wet areas.		√		
<i>Danthonia tenuior</i>	Yes		Wallaby Grass	Plantings may not be successful on site. Use other native grasses in preference.		√		
<i>Dianella caerulea</i>			Flax Lily	Has been found in other ESBS remnants within 10km of Bonnie Doon.		√		
<i>Dianella revoluta</i>	Yes		Flax Lily		√	√	√	√
<i>Dianella revoluta</i>		Yes	Spreading Flax Lily		√	√	√	√
<i>Dichelachne crinita</i>	*	Yes	Plume Grass	Plants occur in small numbers in a few remnants; monitor seed heads so as to collect before seed drop.	√	√	√	√
<i>Echinopogon caespitosus</i>			Hedgehog Grass	Sufficient seed will be very difficult to procure.		√	√	

<i>Eragrostis brownii</i>	**	Yes	Common Love Grass	Sufficient seed will be very difficult to procure.	√	√	√	√
<i>Haemodorum planifolium</i>	**	Yes	Bloodroot	Herb 0.6-1.3 m high. Bag flower heads to collect seeds.	√	√	√	√
<i>Hypolaena fastigiata</i>	**	Yes	Tassel Rope-rush	Inconspicuous rush to ~30-35cm.	√	√	√	√
<i>Isolepis nodosa</i>			Knobby Club-rush	Dense foliage, wet areas. Clumping-forming, ‘knob’ inflorescence. Recommended for planting where suitable habitat occurs on site (elevated moisture content).		√		
<i>Juncus continuus</i>			Rush	Forms clumps, slender stems, 0.5-1.5m.	√	√	√	√
<i>Juncus usitatus</i>			Rush	Wet areas. Plant <i>J. continuus</i> in preference to this.		√		
<i>Lambertia formosa</i>	**	Yes	Honey Flower	Shrub 1-2m, ‘spiky’ foliage, attractive red nectar-producing flowers which attract both birds & insects.	√	√	√	√
<i>Lepidosperma laterale</i>	**	Yes	Variable Sword-sedge	Recommended. Slender sedge 0.5-1.2m, ‘strap’ leaves	√	√	√	√
<i>Leptocarpus tenax</i>		Yes	Slender Twine-rush	Fine-stemmed rush, can form dense closed stands; male/female inflorescences on separate plants.	√	√	√	√
<i>Lepyrodia scariosa</i>		Yes	Scale-rush	Slender rush to 0.5m.	√	√	√	√
<i>Lomandra cylindrica</i>	**		Mat-rush	Slender, tufted plant or sometimes forming a small, dense colony; leaves terete or hemispherical in cross-section, with an acute tip.				√
<i>Lomandra glauca</i>	**		Pale mat-rush	Low, mat-forming groundcover to 0.2m Male / female plants – collect seed from female plants (single globose cluster)	√	√	√	√

<i>Lomandra longifolia</i>	*	Yes	Mat-rush	Dense foliage, strap-like leaves; wet or dry areas. Mass plantings not recommended – include as part of mixed plantings. Avoid cultivated forms.	√	√	√	√
<i>Platysace ericoides</i>	*			Woody perennial herb or subshrub. Flowers bisexual, white, cream or greenish. Has been found in several other ESBS remnants at sites within 10km of Bonnie Doon.	√	√	√	√
<i>Poa labillardieri</i>						√		
<i>Pomax umbellata</i>	**	Yes	<i>Pomax</i>	Recommended. Inconspicuous plant, up to about 20cm at most. Small brown flowers appear in spring.	√	√	√	√
<i>Restio tetraphyllus ssp. meioistachyus</i>			Tassel-rush	Not recorded on the site. Wet areas. Do not plant in ESBS		√		
<i>Rulingia hermanniifolia</i>				Has been found in other ESBS remnants within 10km of Bonnie Doon. ROTAP 3Rca. Include only as part of mixed plantings.		√		
<i>Schoenus ericetorum</i>	**			Tufted perennial.	√	√	√	√
<i>Thermeda australia</i>	*		Kangaroo Grass	Dense foliage, wet areas. Plantings may not be successful (usually prefers richer soils).		√		
<i>Viola hederacea</i>			Native violet	Wet areas. Recommended for planting where suitable habitat occurs on site (elevated moisture content).		√		
<i>Wahlenbergia gracilis</i>	**		Bluebell	Small, slender multi-stemmed herb, attractive bright blue flowers	√	√	√	√

VINES								
Species	Present on site	Listed in FD	Common Name	Plant Character & Comments	Where to Plant			
					Between fairways and holes	In Landscaped areas only	Along Fencelines	In or adjacent to the ESBS
<i>Hardenbergia violacea</i>		Yes	Purple Twining-pea	Slender twiner, attractive leaves & flowers		√	√	√
<i>Cissus hypoglauca</i>			Native Grape	Do not plant into remnants.		√	√	
<i>Hibbertia scandens</i>			Golden Guinea Flower	Robust climber, large yellow flowers, also effective as a groundcover. Recommended for use in landscaping. Has been found in several other ESBS remnants within 10km of Bonnie Doon.		√	√	
<i>Kennedia rubicunda</i>			Dusky Coral Pea	May not survive planting on the site (except in richer soil).		√	√	
<i>Pandorea pandorana</i>			Wonga Wonga Vine	Dense foliage.		√	√	

Appendix 15. Pesticide Application – Record Sheet



Date / /

Spray Licensee Name _____

Pesticide Applied

Fungicide _____ Active _____

Insecticide _____ Active _____

Herbicide _____ Active _____

PGR _____ Active _____

Other _____

Recommended Rate _____

Applied Rate _____

Amount of Product Used _____

Spray Unit _____ Water Rate _____

Tractor Gear & Setting _____ Nozzle Size _____

Spreader Setting _____ Cone Setting _____

Irrigation _____ Rainfall _____

Other Additives _____ Rate _____

Target Organism _____

Area Treated

Greens ALL 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 CH BP TP NUR

Tees ALL 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

Fwys ALL 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

Other ALL 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

Total Area _____ sq.metres

Time Application Commenced _____ Completed _____

Weather Conditions _____ Wind Speed _____ Direction _____

Additional Comments _____

Diligent responsibility and care was enacted to ensure that the appropriate safety equipment was used during the course of chemical application and mixing.

Operators Name _____ Signature _____

Appendix 16. Spray Application – Record Sheet



Spray Application Procedure Manual

Prior to Application

1. Situate appropriate pesticide application warning sign near notice board.
2. Operator must suit with approved and correctly designated:
Spray Suit Respirator Boots Gloves
3. The following procedure is to be carried out at an approved deposit site.
Flush tank of pesticide residuals Clean strainers and filters
Verify nozzle distribution Service indicators/marker receptor
Check pressures and calibration Check hoses and fittings
4. Fill spray tanks with water to 50% capacity prior to adding pesticide.
5. Diligent and meticulous care must be enacted when adding chemicals.

After Application

1. Dispense of remaining pesticide residues at an approved deposit site.
2. Flush Tanks Clean filters, strainers and nozzles Wash down machine
3. Wash, rinse and dry all spray suits, respirators and gloves and store in an approved and properly designated cupboard.
4. Enter all spray application details into approved log book.
5. Applicator to sign log book and ensure spray licensee co-signs.

Applicators signature*Print name*.....

Appendix 17. Fertiliser Application Record Sheet

Bonnie Doon Golf Club FERTILISER SHEET

DATE: _____

MANUFACTURER: _____

PRODUCT: _____

ANALYSIS: _____

PURCHASED: _____

APPLICATOR: _____

AREA APPLIED TO: _____ TOTAL AREA: _____

REC. RATE: _____ ACTUAL RATE: _____

QUANTITY USED: _____ NOZZLE SIZE: _____ WATER RATE: _____

MACHINE GEARING: _____ SPREADER & SETTING: _____

WEATHER COND: _____

COMMENTS: _____

TIME APPLICATION COMMENCED: _____ COMPLETED: _____

Applicator _____

Supervisor _____

Appendix 18. Noxious Weeds for the Botany LGA

Order No. 17, New South Wales Government Gazette No. 13, 10 January 2003

Category	Species	Common Name
W1- the presence of the weed on land must be notified to the local control authority and the weed must be fully and continuously suppressed and destroyed	<i>Acacia karoo</i> <i>Alternanthera philoxeroides</i> <i>Centaurea maculosa</i> <i>Centaurea nigra</i> <i>Chromolaena odorata</i> <i>Eichhornia crassipes</i> <i>Equisetum</i> spp <i>Gymnocoronis spilanthoides</i> <i>Hieracium</i> spp <i>Kochia scoparia</i> <i>Lagarosiphon major</i> <i>Miconia</i> spp. <i>Nassella tenuissima</i> syn <i>Stipa tenuissima</i> <i>Orobancha</i> spp. <i>Parthenium hysterophorus</i> <i>Pistia stratiotes</i> <i>Salvinia molesta</i>	Karoo Thorn Alligator weed Spotted knapweed Black knapweed Siam Weed Water Hyacinth Horsetails Senegal Tea Plant Hawkweeds Kochia Lagerosiphon Miconia Mexican feather grass Broomrape Parthenium Water Lettuce Salvinia
W2 - the weed must be fully and continuously suppressed and destroyed	<i>Cestrum parqui</i> <i>Cortaderia</i> spp <i>Hypericum perforatum</i> <i>Lantana camara</i> <i>Ludwigia peruviana</i> <i>Ricinus communis</i> <i>Rubus fruticosus</i> <i>Toxicodendron succadaneum</i>	Green Cestrum Pampas Grass St John's Wort Lantana Water Primrose Caster Oil Plant Blackberry Rhus Tree
W3 – the weed must be prevented from spreading, and its numbers and distribution reduced.	<i>Chrysanthemoides monilifera</i> <i>Parietaria judaica</i>	Bitou bush/ Boneseed Pellitory
W4f - the weed must not be sold, propagated or knowingly distributed. Any biological control or other control program directed by a local control authority must be implemented	<i>Harrisia</i> spp <i>Opuntia</i> spp	Harrisia cactus Prickly Pear
W4g - the weed must not be sold, propagated or knowingly distributed.	<i>Cabomba</i> spp. Except <i>Cabomba furcata</i> <i>Salix</i> spp except <i>Salix babylonica</i> , <i>S. reichardtii</i> , <i>S. calodendron</i>	Cabomba except Pink Cabomba Willows

Control Categories

Category W1 - A weed which is of limited distribution but poses a severe threat to agriculture, the environment or the community.

Action: The presence of the weed on land must be notified to the local control authority and the weed must be fully and continuously suppressed and destroyed

Category W2 - A weed which is a threat to agriculture, the environment or the community and has the potential to spread to other areas.

Action: The weed must be fully and continuously suppressed and destroyed.

Category W3 - As per W2 weeds but is so widespread that total suppression and destruction is impractical.

Action: The weed must be prevented from spreading and its numbers and distribution reduced..

Category W4 - A weed that is a threat to agriculture, the environment or the community, and has the potential to spread but requires a specific action other than those listed above.

Action: There is one action specified to each weed:

- **W4a** The weed must not be sold, propagated or knowingly distributed and any part of the weed must be prevented from growing within 3 metres of the boundary of a property.
- **W4b** The weed must not be sold, propagated or knowingly distributed and any existing weed must be prevented from flowering and fruiting.
- **W4c** The weed must not be sold, propagated or knowingly distributed and the weed must be prevented from spreading to an adjoining property.
- **W4d** The weed must not be sold, propagated or knowingly distributed and the weed must be fully and continuously suppressed and destroyed if it is:
 - 3 metres in height or less, or
 - within half a kilometre of remnant urban bushland, as defined by SEPP 19, and is not deemed by council as having historical or heritage significance, or
 - is over 3 metres in height and not included in a Management Plan approved by the local control authority.
- **W4e** The weed must be fully and continuously suppressed and destroyed. All reasonable precautions must be taken to ensure produce, soil, livestock, equipment and vehicles are free of the weed before sale or movement from an infested area of the property.
- **W4f** The weed must not be sold, propagated or knowingly distributed. Any biological control or other control program directed by the local control authority must be implemented.
- **W4g** The weed must not be sold, propagated or knowingly distributed.

Appendix 19. Example Spill Containment Procedure

For large scale hazardous spills contact the NSW Fire Brigade (000) immediately for help with cleanup operations.

For cleanup of small scale spills, consult the Material Safety Data Sheets (MSDS) for the chemicals involved in the spill. These data sheets provide relevant information for specific liquid types, and are available from chemical manufacturers and suppliers. The MSDS gives advice on handling, storage and cleanup procedures for liquid chemicals. Your workplace should keep copies of the MSDS for each product that is used.

The following general procedures are recommended in the event of small emergency spills:

- Stop the spill : Stop the source of the spill immediately, if it is safe to do so, in a way that is appropriate to the chemicals involved. This will reduce the level of possible contamination to the environment.
- Contain the spill : Control the flow of the spill and contain the spill appropriate to the type of liquid involved. (Refer to the Material Safety Data Sheet.) Prevent the spill from entering any stormwater drains, by isolating drain inlets.
- Clean up the spill : Clean up the spill by referring to the Material Safety Data Sheets for the type of chemical involved. Cleaning up a spill promptly will help to protect the local environment.

It is important to clean up all spills quickly - even small ones such as oil spills, as these can easily flow into stormwater drains or be washed there by rain.

It is advisable that your workplace develops a spill cleanup plan so that staff can be trained about cleanup procedures. Such a plan could be a simple one that indicates what staff members should do in the event of a spill.

In order for cleanup efforts to proceed successfully it is a good idea to store cleanup material (for example brooms, mops and absorbent material) in an accessible location within the workplace. The whereabouts of these items should also be included in your spill cleanup plan.

Appendix 20. General Tree Protection Measures

Tree protection measures are to be used whenever construction works have the potential to impact on trees on the golf course. The primary purpose of tree protection measures is to protect the root zone and trunk of the tree during construction activities.

At a minimum the Critical Root Zone (CRZ), which can be defined most practically as the diameter of the trees canopy, should remain unaltered by cut, fill, or trenching throughout the construction phase.

Tree protection measures are to be maintained in working order for the duration of building or development works.

Any damage to trees or tree roots during construction works is to be treated by a suitably qualified arborist.

Appendix 21. Dictionary and Category definitions

This section defines and explains some commonly used expressions relating to environmental management and the conservation of biological diversity.

Biodiversity Concepts

Biodiversity (biological diversity) is the variety of life: the different plants, animals and micro-organisms, the genes they contain and the ecosystem of which they form a part. The concept is often considered at genetic, species and ecosystem levels. It is a reflection and essential part of the operation of ecological processes. Some ecosystems are naturally more diverse than others and diversity does not necessarily directly relate to conservation value or management. Conservation of biodiversity is a fundamental principle of ecologically sustainable development.

Ecologically sustainable development (ESD)

The concept and principles of ESD were first developed in the report of the World Commission on the Environment and Development, *Our common Future*, (Brundtland Report 1987). The basic concept of ESD is that present generations should meet their needs without compromising the needs of future generations. In recent years, ESD has been incorporated into environmental legislation and decision-making both in Australia and overseas.

The principles of ESD are:

- a) the precautionary principle – namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation
- b) inter-generational equity – namely, that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations
- c) conservation of biological diversity and ecological integrity
- d) improved valuation and pricing of environmental resources

Cumulative impacts refers to impacts resulting from a multitude of developments or activities, and their interactions in space and time.

Ecological processes are processes, which play an essential role in maintaining the integrity and continuity of an ecosystem. Important ecological processes are water and nutrient cycling, the flow of energy, and natural selection. Ecological processes are often described by the term, natural processes.

An **ecosystem** means a dynamic complex of plant, animal, fungal and micro-organism communities and associated non-living environment interacting as an ecological unit. An important ecosystem function is resilience, which is the capacity of a community or species to recover after disturbance and can be described as recovery potential. Resilience is usually described in terms of the degree, manner and pace of restoration of the structure and function of an original ecosystem after disturbance.

An **ecological community** (or community) is an integrated assemblage of species occupying a particular area.

Habitat is an area or place occupied by a species, population or ecological community. It may be occupied permanently, periodically or occasionally. 'Habitat value' means whether an area is capable of supporting large numbers of a range of species. To enable this, it must have vegetation diversity (both species and structure) and contain a range of sufficient resources such as nesting places, food and protection from predators, etc. as required by each species present.

A **species** is a group of organisms capable of interbreeding freely with each other but (usually) not with members of other species. It includes any defined sub-species and taxon below a sub-species, and any recognisable variant of a sub-species or taxon. An 'indigenous species' is a species that occurs and reproduces naturally within a local area and which has genetic material deriving from that local area. An 'introduced species' means a species that is not locally indigenous to the pre-European Australia. The term 'native species' is normally used to refer to species indigenous to NSW but is also sometimes used to imply a locally indigenous species.

Modification includes those practices which would enable weed invasion, the alteration of hydrology, soil erosion and change to soil structure and chemistry, nutrient enrichment through effluent runoff, or creation of an inappropriate fire regime. Examples may include the probability of increased fire frequency, use of habitat of an EEC for effluent disposal and the extension of Outer Protection areas into an EEC.

Population means a group of organisms, all of the same species, occupying a particular area. A 'sub-species' is a geographically separate population of a species, being a population characterised by morphological or biological differences from other populations of that species.

A **Threatened Species** is a species considered to be at risk of becoming extinct, or of becoming endangered. Such species are listed in the NSW Threatened Species Conservation Act 1995. A 'Rare Species' means a species considered to be unusual or present in small numbers, usually due to a population decline.

Threatening Process means a process that threatens, or may have the capability to threaten, the survival of species, populations or ecological communities.

Vegetation Concepts

Native vegetation is vegetation that is indigenous to Australia, that is, of species that existed in Australia before European settlement. 'Bushland' is defined as land on which there are locally indigenous plant communities which are either a remainder of the indigenous vegetation of the land, or, if altered, are still representative of the structure and floristics of the indigenous vegetation. Bushland includes regrowth of a plant community at any stage of its lifecycle and at any one time some species may only be present as seeds in the soil.

Pick - "to gather, pluck, cut, pull up, destroy, poison, take, dig up, remove or injure the plant or any part of the plant" [s5 NPW Act 1974]

A **plant (or vegetation) community** means a group of organisms living together in a definable region or habitat and defined by the vegetation.

Species composition refers to the floristics of a plant community and means the number, type and relative proportion of different species occurring on a site or in an area. Species composition of bushland varies from site to site.

Vegetation structure means the pattern of the height, form and density of the vegetation.

Wetland means land periodically inundated with water, comprising emergent vegetation dominated by characteristic wetland species.

Fauna Concepts

Fauna means animals, and includes fish, birds, reptiles, invertebrates, mammals, frogs and so on.

Home range means the area used by a species for day to day activities on a seasonal basis such as feeding, breeding and nesting.

Arboreal means living in or associated with trees, tree dwelling.

Nomadic fauna are species which move widely in response to availability of resources, such as food or nesting sites. These species do not necessarily return to the same location on a regular basis.

Migratory species are those that move from one location to another, then return to the same location on a seasonal or annual basis.

Management Concepts

Preservation means management that aims to retain a natural ecosystem system in its current state and to minimise change.

Conservation aims to maintain the continuity of a natural ecosystem, with or without change and refers to the process and actions of looking after a place so as to retain its natural significance. Conservation and preservation include protection, maintenance, enhancement and monitoring.

Restoration means the process of reinstatement of the structure, processes, inter-relationships and dynamics of a natural ecological community. It includes the rehabilitation of an ecosystem to a more complex, healthy, self-sustaining and biodiverse condition. The main objective is to enhance ecological processes, biodiversity and natural productivity.

The **restoration capacity** of an area is a measure of how difficult the restoration of a site will be and is based on an assessment of resilience and robustness. This will determine the type of restoration or rehabilitation that is feasible to undertake.

Bush regeneration means the rehabilitation of bushland from a weed infested or otherwise degraded plant community to a healthy community composed of predominantly indigenous species. Bush regeneration actively encourages natural regeneration of indigenous plant communities and relies on natural germination and resprouting of plants assisted by weed removal, management of disturbance and the enhancement of natural processes. It does not generally include replanting of vegetation.

Assisted regeneration uses natural regeneration but also includes replanting of degraded areas with locally indigenous seed or plant material derived from the locality and from a similar plant community to that occurring on the site.

Bush restoration is the process of restoring degraded bushland where resilience is depleted to a healthier condition. The purpose of restoration is to restore remnant vegetation and habitat to a more resilient and authentic state modelled on the indigenous plant communities of the area. Restoration focuses on repair and rehabilitation of degraded sites in order to reinstate ecological processes and enhance biodiversity. Restoration can include repair and reconstruction of natural elements to facilitate the recovery of natural processes and flora and fauna. It can include reintroduction of species through planting and major changes to the ecosystem structure and function on a site such as earth works or drainage work. Bush restoration is appropriate in situations where there has been significant disturbance to a site. It is proposed for areas where existing remnant vegetation has been degraded to an extent that bush regeneration is not likely to be successful.

For some important plant communities (such as those listed as endangered Ecological Communities) special measures may need to be applied to reconstruct plant communities to the highest possible level of authenticity where they have been extensively disturbed.

Reconstruction through revegetation. Creation of a new plant community is sometimes referred to as reconstruction. This is appropriate where conditions are permanently changed and better-adapted ecological systems can be regenerated/constructed to restore integrity to the landscape. This

refers to a designed plant community with the emphasis on revegetation, which means the planting or establishment of plants on a site with an emphasis on the maintenance of natural processes rather than replication of a previously existing system. Revegetation is normally carried out for specific purposes such as site stabilisation, and prevention of erosion, habitat creation, agriculture, landscaping and improving amenity, modification of groundwater levels and salinity, fixing of atmospheric carbon dioxide in plant material to compensate for greenhouse gas emissions and the like.

Assessments of the condition (or 'health') of native vegetation have regard to the degree of degradation of a plant community. Bush regenerators normally base this on an estimate of weed density and the regenerative (or recovery) potential of a site which is an indication of the potential of the vegetation to re-establish on a site once weeds and other disturbances have been controlled.

Landscaping (or landscape design) is used to describe the activity of modifying the environment for cultural and aesthetic purposes by design. This often includes removal of existing vegetation but can integrate revegetation and other physical structures or works to create a new physical landscape arrangement, use and appearance. Landscaping often ignores or degrades ecological processes that operate on the site. Landscape design using locally indigenous plant material to create an artificial system using local components can be described as native landscaping or retroscaping.

Natural significance means the importance of biodiversity and ecosystems for their existence value, or for present or future generations in terms of their scientific, social, aesthetic and life support value, and is sometimes referred to as conservation importance, significance or value.

Conservation Significance of a species or community is determined by the adequacy of its conservation within reserves such as National Parks or Nature Reserve. Conservation Significance can be broken down into National, State or Regional Significance. If a species or community is rare or threatened across Australia, it may be considered of National Significance and listed under the Commonwealth's Environmental Protection and Biodiversity Conservation Act 1999. If a species or community is rare and threatened within NSW it would be listed under the Threatened Species Conservation Act 1995. Similarly, species that are rare or threatened within a region (i.e. Western Sydney) are of Regional Significance, although in most cases they have no formal listing under legislation.

A **corridor** is an area of habitat that enables migration, colonisation and interbreeding of plants and animals between two or more larger areas of habitat. Corridors may consist of a sequence of discontinuous areas of habitat (such as feeding trees, caves, wetlands and roadside vegetation).

Geographic Concepts

Region is a concept used to group geographic areas having some common feature or relationship, generally for the purposes of administration or study. Regions may coincide with natural boundaries such as water catchments or bioregions, or with socio-economic or other boundaries and are landscape units. Some legislation allows regions to be determined for the purposes of administration.

Locality (or local area). For the purpose of much biodiversity survey work locality refers to an area within a 10km radius of a site. Note that locality has a different meaning to local.

Local refers to a grouping of land at the scale of a single local government area.

Water catchment means the area of land drained by a river or body of water.

A **bioregion** (or bio-geographic region) is a region in which the boundaries are determined by (or reflect) similarities in geology, climate and vegetation.

Scale means the level or extent or geographic area to which an issue relates. For example spatial scales commonly used are global, continental, regional, catchment, local and site. Temporal scales can also apply and range from long-term to short-term.

Legal and Administrative Concepts

Development means the erection of a building, the carrying out of a work, the use of land, or the subdivision of land and is defined in the Environmental Planning and Assessment Act 1979. This definition is used for regulating development and land use in environmental planning instruments.

Activity means an action, whether a use of land or in association with use of land, leading to a disturbance or change to the ecosystems on the land.

A **land management plan (or plan of management)** is a document describing land and how it will be managed. A land management plan may be generic (applying to a number of situations such as a catchment or local government area) or site specific. Plans may be legally binding (such as a condition of consent), required by legislation (such as for community land identified in the Local Government Act 1993) or advisory (private farm management plans).

Land and Environment Court Definitions

Likely ‘a real or not remote chance or possibility regardless of whether it is less or more than 50%’

Significant ‘important, notable, weighty, or more than ordinary’.

Appendix 22. Abel Ecology - Company Profile

Abel Ecology is the consulting service of Blue Mountain Wilderness Services Pty Ltd.

Blue Mountain Wilderness Services Pty Ltd has been in the flora and fauna consulting business since 1991, starting in the Blue Mountains, and progressively more state wide during the last 7 years. During this time extensive expertise has been gained with regard to Environmental Impact assessments including flora and fauna, bushfire reports, Vegetation Management Plans, Management of Threatened Species, Review of Environmental Factors, Species Impact Statements and as Expert Witness in the Land and Environment Court. We have done consultancy work for industrial and commercial developments, golf courses, civil engineering projects, tourist developments as well as residential and rural projects. This process has also generated many connections with relevant government departments and city councils in NSW. Our team consists of four scientists and two administrative staff, plus casual assistants as required.