



FORESHORE ASSESSMENT IN THE HELENA RIVER CATCHMENT



WATER RESOURCE MANAGEMENT SERIES

WATER AND RIVERS COMMISSION REPORT NO. WRM 20
2001



WATER AND RIVERS
COMMISSION

Foreshore assessment in the Helena River Catchment

Prepared by
Nicole Siemon
Ecosystem Management Services

Jointly funded by



Natural Heritage Trust



**WATER AND RIVERS
COMMISSION**

WATER AND RIVERS COMMISSION

REPORT NO. WRM 20

FEBRUARY 2001



Acknowledgments

This report has been jointly funded by the Natural Heritage Trust and the Water and Rivers Commission.

This report was prepared by Nicole Siemon, Senior Environmental Consultant, Ecosystem Management Services (EMS).

Methodology development by Nicole Siemon, EMS in consultation with Dr Luke Pen and Jodie Oates, Water and Rivers Commission.

Surveys and mapping were undertaken by Nicole Siemon and Ben Waining, EMS.

Digital map production by Brett Harrison, Banksia Environmental Mapping.

Project coordination by Heidi Bucktin and Virginia Shotter, Water and Rivers Commission.

Many members of the community and catchment group representatives provided valuable input and feedback in the development of the methodology and surveys.

Reference Details

The recommended reference for this publication is:
Water and Rivers Commission 2001, *Foreshore Assessment in the Helena River Catchment*. Water and Rivers Commission, Water Resource Management Series, No WRM 20.

ISBN 0-7309-7496-0

ISSN 1326-6934

*Text printed on 100gsm recycled stock,
Cover, 250gsm Sapphire Dull
February 2001*



Foreword

Landcare groups in Western Australia have been concerned with the protection and rehabilitation of river systems for some time. However, with such large areas to cover, and many streams being in private ownership, there is a lack of information available to many groups to assist them in making management decisions.

In 1995 Pen and Scott developed a technique for '*Stream Foreshore Assessment in Farming Areas*'.

This provided a standardised assessment technique that can be performed by groups and individual landholders themselves. It has been widely accepted and used to successfully assess many streams throughout south-west WA. As use of the technique has expanded from farm to catchment scale surveys, some users began to express a need for a modification of the methodology that would enable them to assess streams in urban and semi-rural environments, where there are a different suite of issues to be considered. In 1997 the Water and Rivers Commission obtained Natural Heritage Trust funding to assist in the development of a foreshore condition assessment methodology suitable for use in urban areas and to undertake surveys on several major tributaries of the Swan-Canning Catchment.

Nicole Siemon and Kelly Shepherd of Ecosystem Management Services (EMS), in consultation with the Water and Rivers Commission, have developed a technique for '*Foreshore Condition Assessment in Urban and Semi-rural Areas*'. The assessment technique is comprehensive, yet like that of Pen and Scott, does not require specialised knowledge or expensive technical assistance and hence assessment can be performed by groups and individuals themselves.

The methodology considers overall stream condition to be comprised of four major parameters that are independently assessed and the results are then combined to determine the overall stream condition.

Bank stability includes assessment of bank slope, erosion, slumping, sedimentation and stabilising structures.

Foreshore vegetation structure and composition, includes the use of tables with native and weed species commonly found in the region. This allows for straightforward yet comprehensive vegetation surveys

looking at abundance, health and regeneration of individual species.

Stream cover recognises the importance of overhanging native vegetation and in-stream cover, and notes the abundance of native and exotic vegetation and the presence of deciduous trees.

Habitat diversity includes stream form, water quality and identifies habitat requirements for a variety of terrestrial and aquatic fauna.

Along with recording information on stream condition at the time of the survey the methodology also ensures that information is collected that will aid groups in making management decisions. This information includes disturbance factors, surrounding land use, evidence of existing management and special cultural or spiritual significance.

The condition assessment technique that has been developed has several features that are particularly important in helping groups make their own river management decisions. The techniques:

- do not require specialised knowledge or expensive technical assistance and surveys can therefore be undertaken by individual landholders or by community groups;
- immediately provide managers with data to aid them in their decision making, especially in prioritisation of works;
- provide standardised data suitable for compilation and comparative assessment, even when using data collected by a variety of groups and individuals; and
- provide standardised data suitable for ongoing monitoring and evaluation.

The methodology has been tested on several tributaries in the Swan-Canning catchment. These tributaries have active catchment groups working on, or planning rehabilitation works. Reaches surveyed were those identified by the catchment groups as priority areas in which they plan to be undertaking works. It is hoped that this report will assist in the long-term management of these tributaries.



Contents

1. Introduction	1
1.1 Need for this study	1
1.2 Community involvement process	1
1.3 This report	2
2. Methodology	3
2.1 Site selection within tributaries	3
2.2 Implementing the survey	3
2.2.1 Undertaking foreshore surveys	3
2.2.2 Environmental parameters of foreshore condition	3
2.2.3 Collating the results	7
3. Key findings for the Helena River Catchment	8
3.1 Bank stability	8
3.2 Vegetation	8
3.2.1 Native species	8
3.2.2 Weeds	9
3.3 Stream cover	9
3.4 Habitat diversity	9
3.5 Overall summary conditions for all surveyed sites	10
3.5.1 Summary results for Helena River Catchment	10
4. Specific site reports	13
4.1 Bending Gully Creek	13
4.2 Fred Jacoby Reserve - Bending Gully Creek	33
4.3 Nelson Road - CALM Reserve	41
4.4 Nyaania Creek	49
4.5 Kidman Avenue - Helena River	61
4.6 Scott Road - Helena River	77
4.7 Chittawarra Brook	87
5. General recommendations	98
5.1 Planning	98
5.2 Site preparation	98
5.2.1 Weed control	98
5.2.2 General site preparation	99
5.3 Planting out	99
5.4 Maintenance	99
5.5 Monitoring	99
6. Common issues	100
6.1 Ownership and access	100
6.2 Developing management and rehabilitation plans	100
6.3 Long term management	101



6.4 Surrounding land use	101
6.5 Gaining support from state and local government	102
6.7 Fire management.....	102
6.8 Notes on reclamation on salt affected land	102
6.9 Access to information	104
7. Matters for consideration.....	105
7.1 Liaison with government agencies	105
7.1.2 Water and Rivers Commission and the Swan River Trust	105
7.1.3 Local Government Authority.....	105
7.1.4 Department of Environmental Protection.....	106
7.1.5 Ministry for Planning	106
7.1.6 Main Roads Western Australia	106
7.1.7 Department of Conservation and Land Management	106
7.1.8 Agriculture Western Australia (AGWEST)	106
7.1.9 Fire & Emergency Services Authority of WA.....	107
7.2 Further information.....	107
8. Summary	108
9. References and recommended reading.....	109

Appendices

Appendix 1A: Native species identified during the foreshore assessment process (1999) – Stage 2	112
Appendix 1B: Weed species identified during the foreshore assessment process (1999) – Stage 2	118
Appendix 2: Suggested weed control methods	120
Appendix 3: Suggested species for revegetation works	146
Appendix 4: Suggested soft engineering works.....	152
Appendix 5: Condition mapping symbols.....	154

List of tables

Table 1: Helena River Catchment selected sites.....	2
Table 2: Colour codes and points value for ranking stream conditions.	4
Table 3: The determination of foreshore health.....	5
Table 4: Stream Condition Index	7
Table 5: Some suggested salt tolerant species.	103

List of maps

Bending Gully Creek Site 1: Map 1 (Section B).....	23
Bending Gully Creek Site 1: Map 2 (Section B).....	24
Bending Gully Creek Site 1: Map 3 (Section A, Part B & Part C).....	25
Bending Gully Creek Site 1: Map 4 (Section C).....	26



Bending Gully Creek Site 1: Map 5 (Section C).....	27
Bending Gully Creek Site 1: Map 6 (Part Section B & Part C).....	28
Bending Gully Creek Site 1: Map 7 (Section B)	29
Bending Gully Creek Site 1: Map 8 (Section B)	30
Bending Gully Creek Site 1: Map 9 (Part Section & Part B).....	31
Bending Gully Creek Site 1: Map 10 (Section A).....	32
Fred Jacoby Reserve, Bending Gully Creek Site 1B: Map 1	37
Fred Jacoby Reserve, Bending Gully Creek Site 1B: Map 2.....	38
Fred Jacoby Reserve, Bending Gully Creek Site 1B: Map 3.....	39
Nelson Road, CALM Reserve Site 2: Map 1	45
Nelson Road, CALM Reserve Site 2: Map 2	46
Nelson Road, CALM Reserve Site 2: Map 3	47
Nelson Road, CALM Reserve Site 2: Map 4.....	48
Nyaania Creek Site 3: Map 1 (Section A).....	56
Nyaania Creek Site 3: Map 2 (Section A).....	57
Nyaania Creek Site 3: Map 3 (Section A & B)	58
Nyaania Creek Site 3: Map 4 (Section B).....	59
Kidman Ave - Helena River Site 4: Map 1.....	65
Kidman Ave - Helena River Site 4: Map 2.....	66
Kidman Ave - Helena River Site 4: Map 3.....	67
Kidman Ave - Helena River Site 4: Map 4.....	68
Kidman Ave - Helena River Site 4: Map 5.....	69
Kidman Ave - Helena River Site 4: Map 6.....	70
Kidman Ave - Helena River Site 4: Map 7.....	71
Kidman Ave - Helena River Site 4: Map 8.....	72
Kidman Ave - Helena River Site 4: Map 9.....	73
Kidman Ave - Helena River Site 4: Map 10.....	74
Kidman Ave - Helena River Site 4: Map 11.....	75
Kidman Ave - Helena River Site 4: Map 12.....	76
Scott Street - Helena River Site 5: Map 1	81
Scott Street - Helena River Site 5: Map 2.....	82
Scott Street - Helena River Site 5: Map 3	83
Scott Street - Helena River Site 5: Map 4	84
Scott Street - Helena River Site 5: Map 5.....	85
Chittawarra Brook Site 6: Map 1.....	91
Chittawarra Brook Site 6: Map 2.....	92
Chittawarra Brook Site 6: Map 3.....	93
Chittawarra Brook Site 6: Map 4.....	94
Helena River Locality Map: Sites 1 & 1B	95
Helena River Locality Map: Sites 2, 3, 5 & 6.....	96
Helena River Locality Map: Site 4.....	97



1. Introduction

The riparian zone adjacent to natural watercourses acts as a buffer to the surrounds. Healthy foreshore vegetation stabilises the foreshore banks, and slows and filters water thus reducing erosion of the banks and sedimentation of major channels. Foreshore vegetation also provides stream cover and suitable habitats for aquatic and terrestrial animals. Often these areas are a haven for native fauna, particularly during the dry summer months.

Riparian areas have always been a focus for development and as a consequence are often highly degraded. The major threats to foreshore health are the loss of native vegetation or a decline in health due to weed invasion. The loss of deep-rooted native plants often causes the destabilisation of foreshore banks, leaving these areas prone to erosion particularly during peak flow events.

Gaining an understanding of the health of river foreshores is the first step towards developing appropriate management strategies to protect and enhance these areas.

1.1 Need for this study

Community groups are becoming increasingly interested in foreshore management and are taking an active role in this process. This interest in foreshores provides opportunities to collect substantial data about waterways.

The need for a standard methodology to assess foreshore condition in both rural and urban environments was recognised to ensure consistency of information

gathering. This led to the development of the Foreshore Assessment Proforma (Shepherd and Siemon 1999; WRC report RR2) during Stage 1 of the foreshore assessment surveys undertaken by Ecosystem Management Services (EMS) on behalf of the Water and Rivers Commission (WRC) and the Natural Heritage Trust (NHT) (WRC Report No. WRM 13, 1999). The Stage 1 surveys were conducted along the waterways of the Bennett Brook, Canning and Ellen Brook catchments.

This report comprises work undertaken by EMS for the Foreshore Assessment Stage 2 Project. Stage 2 involved testing the suitability of the proforma within a broader range of environments, including the Perth Hills and eastern side of the Swan Coastal Plain.

1.2 Community involvement process

The intended audience for the Foreshore Assessment Stage 2 is State and local government officers and the community. Site selection was dependent on advice from local residents, local government and catchment groups with an interest in the health of their waterways.

Discussions were held with community groups to determine specific areas of interest for each catchment group. Each group identified priority foreshore areas to undergo assessment during Stage 2 (Table 1). The locations selected included areas that were already a focus or are potential sites for future rehabilitation works.

The sites surveyed, as nominated by the Helena River Catchment Group, for this second stage of surveys, were as follows:



Table 1: Helena River catchment selected sites

Site No	Location	Situated
1	Bending Gully Creek	Mundaring Weir Road
1B	Fred Jacoby Reserve	Bending Gully Creek
2	Nelson Road	CALM Reserve
3	Nyaania Creek	Victor Road Reserve
4	Helena River	Kidman Avenue
5	Helena River	Scott Road
6	Chittawarra Brook	Hardey Road

As a result of time constraints and access difficulties not all of the foreshore areas that were nominated by the community group were surveyed.

1.3 This report

This report summarises the results of the Stage 2 Foreshore Assessment Surveys using the foreshore condition assessment proforma (Shepherd and Siemon 1999; WRC Report RR2). It provides a description of the current status of the foreshore environment, and identifies major threats to the health of the area.

Recommended strategies for appropriate management of future works on the focus foreshore areas are also detailed in the document. Information is provided on weed control techniques, recommended native species for foreshore rehabilitation and how to undertake soft engineering works.



2. Methodology

2.1 Site selection within tributaries

Following the community involvement process the nominated sections of the selected waterways were assessed to determine the most appropriate areas for the foreshore survey. This was based on the need to assess a complete range of foreshore health in a variety of areas, to ensure that the proforma continued to be sufficiently balanced to cover all situations ranging from rural to urban.

2.2 Implementing the survey

The foreshore assessment survey proforma has been developed to enable community groups to assess the condition of foreshores in urban and semi-rural areas. For detailed information on the methodology used to assess foreshore condition refer to Shepherd and Siemon 1999; WRC Report RR2.

As outlined above, this process ensures consistency of information gathering over time, allowing the information collected from multiple surveys by various people to be collated. The accumulated information can then be used to prepare management plans and identify priority areas for rehabilitation. The results can also be used to monitor changes over time and to compare different foreshore areas; and be shared amongst State and local government authorities and the community.

2.2.1 Undertaking foreshore surveys

Each of the foreshore areas selected was traversed before survey. The foreshore was then divided into relatively homogeneous sections of similar vegetation structure and land use. A survey was conducted for each of these sections, and the condition of the foreshore parameters was calculated and the overall Stream Condition Index determined.

In areas where foreshore vegetation was very dense on both banks, both sides were surveyed separately and a form was completed for each side. On highly degraded

rivers where the foreshore along both banks was easily observed from one side, and the vegetation and disturbance factors were similar, a single survey form was completed for both sides.

Scaled baseline maps were prepared by the Water and Rivers Commission showing cadastral boundaries and the waterway. The cadastral information assists in identifying location out in the field. As each homogeneous section was identified, information was sketched onto baseline maps. Other information such as the composition and location of native vegetation along the foreshore, the location and extent of predominant weeds and the presence of disturbance factors such as discharge pipes and other infrastructure was detailed on each map. Fences and remedial works were also noted.

Note that the left and right sides of the main channel are defined with respect to the view upstream.

2.2.2 Environmental parameters of foreshore condition

Principal environmental parameters are used as indicators of foreshore condition and are assessed during the foreshore survey to determine the overall Stream Condition Index.

These parameters are:

- bank stability
- foreshore vegetation
- stream cover
- habitat diversity

A colour-coded system has been developed to summarise the condition of each of the above environmental parameters. This system allows the information to be provided in an immediately recognisable form. The status of each of the parameters is assessed and graded from Blue (Excellent) to Black (Very Poor) (Table 2) using the criteria outlined in Table 3. For example, the bank stability of an area is



determined by assessing the level of erosion, slumping and sedimentation along the foreshore. In a pristine area where there is no discernible decline in condition and no obvious erosion, the bank stability may be graded as Blue. In a highly modified system where the foreshore

is highly degraded and subject to severe erosion and bank collapse, bank stability may be graded as Red or Black. A scoring system is linked to this process to provide a quantitative method of calculating stream health.

Table 2: Colour codes and points value for ranking stream conditions

Condition	Excellent	Good	Moderate	Poor	Very Poor
Colour rating	Blue	Green	Yellow	Red	Black
Score	8	6	4	2	0

From: Shepherd and Siemon 1999; WRC Report RR2.



Table 3: The determination of foreshore health

	Blue - Excellent 8 points	Green - Good 6 points	Yellow - Moderate 4 points	Red - Poor 2 points	Black - Very poor 0 points
Bank Stability	No erosion, slumping or sediment deposits; dense native vegetation cover on banks and verge; no evidence of disturbance or areas of exposed soil.	No significant erosion, slumping or sediment deposits in floodway or on lower banks; good native vegetation cover; only isolated areas of exposed soil or thinning vegetation.	Some localised erosion, slumping and sediment deposits; native vegetation cover on verges may be patchy and interspersed with patches of exposed soil.	Extensive active erosion slumping and sediment desposition particularly during peak flows; bare banks and verges common.	Almost continuous erosion; over 50% of banks slumping; sediment heaps line or fill much of the floodway; little or no vegetation cover.
Foreshore vegetation	Healthy, undisturbed native vegetation with structure intact and verges more than 20 m wide; no weed or signs of disturbance evident.	Vegetation structure dominated by native plants that comprise 80 - 100% of the total number of species; only scattered weeds or rarely evident in small clusters; nil or minor signs of disturbance (i.e: tracks, rubbish dumping).	Some changes in vegetation structure, native plants comprising of 50 - 80% of the total species composition; little regeneration of trees and shrubs; weeds occurring occasionally; moderate levels of disturbance.	Modified vegetation structure with native plants comprising only 20 - 50% of the total species composition. Trees remain with only scattered shrubs and an understorey dominated by weeds; high prevalence of disturbance.	Insufficient vegetation to control erosion; natural vegetation structure absent with occasional native trees and shrubs comprising less than 20% of the total species composition; weeds abundant; very high prevalence of disturbance and extensive areas of exposed soil.

	Blue - Excellent 8 points	Green - Good 6 points	Yellow - Moderate 4 points	Red - Poor 2 points	Black - Very poor 0 points
Stream Cover	Abundant stream cover from dense overhanging vegetation providing almost continuous shade; frequent instream cover from aquatic vegetation and/or leaf litter, rocks or logs.	Abundant shade from overhanging vegetation; occasional instream cover from patches of aquatic vegetation and isolated heaps of leaf litter or rocks and logs.	Scattered fringing vegetation with occasional patches of shade; infrequent instream cover with little aquatic vegetation, very infrequent rocks and logs.	Stream channel mainly clear; fringing vegetation almost absent providing very little permanent shade; instream cover almost absent with generally no instream vegetation and very infrequent rocks and logs.	Zero or minimal stream cover with no permanently shaded areas and no instream cover.
Habitat Diversity	Excellent water quality with permanent water (i.e: pools and creeks); three or more aquatic and terrestrial habitats including diverse vegetation types, edge waters, instream cascades, riffles, pools and woody debris.	Good water quality and some permanent water; at least three aquatic habitat types; at least one habitat type for terrestrial invertebrates; at least one habitat type for each terrestrial vertebrate category (frogs, reptiles and birds).	No apparent problems with water quality (i.e: muddy or cloudy in winter); at least two aquatic habitat types; at least one habitat type for terrestrial invertebrates; at least one habitat type for any two of the terrestrial vertebrate categories.	Possible seasonal problems with water quality and no permanent water; at least one aquatic habitat type; at least one habitat type for terrestrial invertebrates; at least one habitat type for one of the terrestrial vertebrates.	Poor water quality; almost no healthy habitats available for aquatic and terrestrial organisms.

The Stream Condition Index is a summary of the foreshore environmental parameters (Table 4) and is an indication of the overall stream condition.

Table 4: Stream Condition Index

Colour Code	Parameter Rating	Description
Blue (32 points)	Excellent	All parameters blue.
Green (22-30 points)	Good	Three to four parameters rated green or better with only one parameter rated yellow; no red or black ratings.
Yellow (14-20 points)	Moderate	Three parameters rated yellow or better with no more than one red; no black
Red (6-12 points)	Poor	Two or three parameters rated red with no more than one black.
Black (0-4 points)	Very Poor	Two or more parameters rated black.

2.2.3 Collating the results

The results compiled from the foreshore surveys of the selected sites were collated and a series of maps produced. These maps were digitised to enable presentation of the foreshore information in a visual format with corresponding text. The summary codes of the condition of the four environmental parameters

assessed at each site and the overall Stream Condition Index are included on each summary map.

This report also contains a detailed description of each site surveyed outlining the key findings of the four environmental parameters assessed and recommended strategies for appropriate remedial works.



3. Key findings for the Helena River Catchment

The majority of the sites surveyed within the Helena River catchment were situated within either recreation reserves (bush or parklands) or private rural properties. The detrimental impact on the health of the waterways and riparian zones due to the surrounding landuse is particularly evident along the section East of Scott Road Bridge (Site 5), where modified semi-rural and residential lots border the Helena River. These surroundings have impacted on the riparian zone, resulting in Poor quality vegetation and Bank Stability and an overall Poor Stream Condition Index.

3.1 Bank stability

Bank stability is determined by the extent of erosion and slumping occurring along foreshore banks and the level of sedimentation within stream channels. Erosion is evident at almost all sites to varying degrees. Within the sites surveyed in the Helena catchment, the levels of bank stability range from Excellent (Blue) to Very Poor (Black) ratings.

Those areas, which have obtained an Excellent (Blue) rating for bank stability, such as the northern end of the Bending Gully Creek (Site 1, Section A), do not exhibit levels of bank destabilisation greater than that expected by natural river processes. This is in part largely due to the health of the surrounding bushland reserve within which this section is contained. The condition of the surrounding vegetation is rated as Excellent (Blue) and there are no access tracks or other infrastructures that could impact on the waterway, further contributing to bank stability.

Chittawarra Brook (Site 6) in contrast to the above site, has an overall rating of Very Poor (Black). Here the brook runs through private rural properties and generally it is an incised channel running through open pastured paddocks. Much of the fringing vegetation along the riparian zone, which usually acts to stabilise foreshore banks, has been physically removed or has been grazed out. As a result the brook exhibits severe levels of destabilisation, erosion and undercutting of banks. Incidences of severe scouring are particularly predominant around a dam outfall point and at the southern end of the section where the brook passes

through a culvert before flowing into the Helena River. The lack of appropriate structures to help minimise erosion exacerbates these incidences of scouring. This highlights the need for careful planning prior to the construction of any drainage infrastructure that may result in deleterious hydrological changes.

The remaining sites surveyed along the Helena Catchment were rated as being in Moderate (Yellow) to Poor (Red) bank stability.

3.2 Vegetation

The foreshore vegetation condition of the surveyed sites ranged from Excellent (Blue) to Very Poor (Black). The area within Bending Gully (Site 1, Section A) was rated Excellent (Blue) due to the presence of a diverse range of native plant species within the understorey, middlestorey and overstorey strata. There were no significant weed species noted in the area. In contrast, the residential/semi-rural area along Nyaania Creek at Site 3, Section B had a vegetation condition rated as Very Poor (Black), due to the predominance of weeds and exotic species at the site and a lack of native plants present in the understorey and middlestorey levels and only scattered native species present in the overstorey.

3.2.1 Native species

The benefit of maintaining healthy native vegetation along foreshore zones has been well documented (Pen and Majer 1993; Riding and Carter 1992). Native vegetation provides a range of suitable habitats and food resources for local fauna, deep rooted trees and shrubs support foreshore banks of the waterway and minimise the impact of erosion and subsequent bank destabilisation. Native plant communities are also less likely to block waterways (Pen 1999).

The native overstorey along the surveyed sections of the Helena River Catchment was predominantly characterised by *Corymbia calophylla* (Marri) and *Eucalyptus marginata* (Jarrah). There were also occasional *E. rudis* (Flooded Gum) *E. wandoo* (Wandoo) and *Melaleuca raphiophylla* (Swamp Paperbark) trees present within the overstorey.



The middlestorey of the surveyed sites comprised dense stands of a range of species including *Acacia pulchella* (Prickly Moses), *A. saligna* (Coojong), *A. alata* (Winged Wattle), *Agonis linearifolia* (Swamp Peppermint), *Hakea cristata* (Snail Hakea), *H. lissocarpha* (Honey Bush) and *Trymalium ledifolium*. *Xanthorrhoea preissii* (Grass Tree), *Allocasuarina humilis* (Dwarf Sheoak), *Grevillea endlicheriana* (Spindly Grevillea) and *Viminaria juncea* (Swishbush) also frequently occurred.

Common understorey species include *Hakea prostrata* (Harsh Hakea), *Macrozamia reidleyi* (Zamia), *Schoenus* sp., *Leucopogon* spp., *Hibbertia spicata* (Yellow Buttercups), *Kennedia prostrata* (Running Postman), *Dryandra nivea* (Couch Honeypot), *Darwinia citriodora* (Lemon Scented Darwinia), *Alexgeorgea arenicola*, *Corynotheca micrantha* and *Baeckea camphorosmae* (Camphor Myrtle). A detailed list of species identified during the foreshore assessment survey is also included in this report (Appendix 1A).

3.2.2 Weeds

Exotic deciduous trees, such as the Edible Fig (*Ficus carica*) and Oak (*Quercus* sp.) are common along many degraded foreshores in urbanised, semi-rural and rural areas. These trees were originally planted to beautify cleared foreshore areas or they may have escaped from nearby gardens and parks. Foreshore health maybe threatened by the presence of numerous deciduous trees, as sudden leaf drop during the autumn months may introduce large amounts of leaf material into the waterway. High levels of detritus in the water column may decrease oxygen levels as the soft leaves begin to breakdown and this in turn will impact on instream organisms. This sudden loss of leaves will also minimise the levels of stream cover along foreshores.

Common exotic trees present within the overstorey include Edible Fig (*Ficus carica*), Wattle (*Acacia* spp.), Radiata pine (*Pinus radiata*) and Cork Oak (*Quercus* sp.). There were also occasional occurrences of Willow (*Salix* sp.), Japanese Pepper (*Schinus terebinthifolia*) and Olive (*Olea europaea*) trees.

Dense weeds frequently dominated the middlestorey of many of the disturbed sites. Species such as the declared Cotton Bush (*Gomphocarpus fruticosus*), Castor Oil (*Ricinus communis*), Bulrush (*Typha orientalis*), Blackberry (*Rubus fruticosus*) and the Giant Reed (*Arundo donax*) were common.

The dominant weeds present in the understorey include *Watsonia* (*Watsonia bulbifera*), Bridal Creeper (*Asparagus asparagoides*), Soursob (*Oxalis pes-caprae*), Kikuyu (*Pennisetum clandestinum*), Arum Lily (*Zantedeschia aethiopica*), Dock (*Rumex* spp.), Gladiolus (*Gladiolus* sp.), *Paspalum* spp. and Guildford Grass (*Romulea rosea*).

3.3 Stream cover

The level of overhanging vegetation and the abundance of native and non-deciduous exotic species along the foreshore determines the level of stream cover and permanent shade available along a waterway. Instream emergent and submerged vegetation and the presence of rocks and logs also provide cover for aquatic organisms.

Within the sites surveyed in the Helena River catchment the abundance of stream cover varied from Excellent (Blue) at Bending Gully (Site 1 - Section A), to Very Poor (Black) along the Chittawarra Brook (Site 6 – Section B).

Areas where the stream cover was rated as Poor (Red) or Very Poor (Black) featured sparse fringing vegetation, and frequently had an understorey dominated by weed species. This was particularly evident at Chittawarra Brook (Site 6 – Section B), where the foreshore is a grazed pasture area dominated by weeds. The stream cover was limited to the occasional exotic or native tree species overhanging the stream. These areas were also devoid of any significant levels of instream cover.

In contrast Bending Gully (Site 1 – Section A) exhibited a stream cover rating of Excellent (Blue). This is due to the fact that the fringing vegetation is largely undisturbed, providing frequent to abundant levels of cover along the foreshore. Instream cover is also maintained in this area by the presence of vegetation and branches within the main channel of the creek.

3.4 Habitat diversity

Healthy, diverse streamside vegetation provides suitable habitats for terrestrial organisms and overstorey trees offer roosting and nesting sites for birds. Instream habitat diversity is affected by the quality and permanency of water and by the presence of instream rocks, submerged and emergent vegetation and logs. These features provide substrates for attachment for aquatic invertebrates, cover for fish and potential basking sites for turtles.



The habitat value of the sites surveyed within the Helena River catchment ranged from Excellent (Blue) to Very Poor (Black). The quality of habitat at the various sites is attributable to a variety of factors, including the permanency of water, vegetative diversity and the presence of instream features. The presence of permanent water is generally a defining feature of an excellent rating however this may be misleading for the sites surveyed in the Scarp region. Many of the upper reaches of the waterway are expected to be seasonal, with permanent water only occurring where there are permanent seeps. The lack of permanent water often results in the downgrading of many sites. It may be beneficial therefore to reduce the weighting of this character when surveying the headwaters of a catchment area. However the presence of permanent pools should still be valued as important and subsequently ensure a higher rating.

The site with the best habitat diversity rating was Bending Gully (Site 1 - Section A) due to the diversity and health of the vegetation of the area and the range of aquatic features present. This site exhibited an Excellent (Blue) rating, despite the lack of permanent water within the creek. As stated previously, this situation is characteristic of the upper reaches (headwaters) of catchments, where seasonal water flow is expected.

The habitat diversity was rated Poor (Red) along Bending Gully (Site 1 – Section C) within the Fred Jacoby Reserve. This area is a Department of Conservation and Land Management managed recreation reserve containing limited vegetation diversity, and no significant instream features to provide adequate cover for aquatic species.

3.5 Overall summary conditions for all surveyed sites

The overall condition of the foreshore sections surveyed for each of the sites is summarised below.

3.5.1 Summary results for Helena River catchment

Summary of river health: Site 1 – Section A - Bending Gully Creek

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Blue	Blue	Blue	Blue
Excellent	Excellent	Excellent	Excellent
8	8	8	8

Stream Condition
Blue
Excellent
32

Summary of river health: Site 1 - Section B - Bending Gully Creek

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Yellow	Yellow	Yellow	Red
Moderate	Moderate	Moderate	Poor
4	4	4	2

Stream Condition
Yellow
Moderate
14



Summary of river health: Site 1 - Section C – Bending Gully Creek

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Yellow	Red	Red	Black
Moderate	Poor	Poor	Very Poor
4	2	2	0

Stream Condition
Red
Poor
8

Summary of river health: Site 1B – Fred Jacoby Reserve, Bending Gully Creek

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Yellow	Yellow	Yellow	Yellow
Moderate	Moderate	Moderate	Moderate
4	4	4	4

Stream Condition
Yellow
Moderate
16

Summary of river health: Site 2 – Nelson Rd CALM reserve

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Yellow	Yellow	Green	Green
Moderate	Moderate	Good	Good
4	4	6	6

Stream Condition
Yellow
Moderate
20

Summary of river health: Site 3 - Section A - Nyaania Ck

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Red	Yellow	Red	Yellow
Poor	Moderate	Poor	Moderate
2	4	2	4

Stream Condition
Red
Poor
12

Summary of river health: Site 3 - Section B - Nyaania Ck

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Red	Black	Red	Black
Poor	Very Poor	Poor	Very Poor
2	0	2	0

Stream Condition
Black
Very Poor
4



Summary of river health: Site 4 - Helena River - Kidman Avenue

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Red	Red	Yellow	Yellow
Poor	Poor	Moderate	Moderate
2	2	4	4

Stream Condition
Red
Poor
12

Summary of river health: Site 5 - Helena River - Scott Road

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Red	Red	Yellow	Red
Poor	Poor	Moderate	Poor
2	2	4	2

Stream Condition
Black
Very Poor
10

Summary of river health: Site 6 Chittawarra Brook – Hardey Road

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Black	Red	Black	Red
Very Poor	Poor	Very Poor	Poor
0	2	0	2

Stream Condition
Black
Very Poor
4



4. Specific site reports

4.1 Bending Gully Creek

Results Foreshore Condition Survey

A Study undertaken on behalf of
Water and Rivers Commission and the Natural Heritage Trust



Helena – Site 1: Map 10, 9 (Section A) Bending Gully Creek

Length of section (m): 800 m
Recorder's name: B Waining
Date surveyed: 6/7/99
Nearest road access: Mundaring Weir Road
Lot number(s): 5262

Summary of river health:

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Blue	Blue	Blue	Blue
Excellent	Excellent	Excellent	Excellent
8	8	8	8

Stream Condition
Blue
Excellent
32

Description

Bank stability: The banks of this section of the creek have a moderate slope of 10-45°, with minimal to no evidence of erosion, sedimentation or slumping. The channel is up to 1 m in width. Bank height does not exceed 30 cm. There are no artificial stabilisation structures present.

Vegetation: This section of stream is relatively undisturbed, and is contained within a bushland reserve. Vegetation along this section of this creek consists exclusively of native species within the upper, middle and understoreys. There is continuous cover provided by all levels of the vegetative structure. The overstorey is characterised by abundant *Corymbia calophylla* (Marri) and *Eucalyptus marginata* (Jarrah). The middlestorey is dominated by frequent *Xanthorrhoea preissii* (Grass Tree), *Hakea amplexicaulis* (Prickly Hakea), *H. lissocarpha* (Honeybush), *H. undulata* (Wavy Leaved Hakea), *Agonis linearifolia* (Swamp Peppermint), *Acacia alata* (Winged Wattle) and *A. pulchella* (Prickly Moses). The understorey consists of

Recommended Strategies

- Protect the existing high quality of the current vegetation, from encroaching weeds. Formalise access tracks and install signage requesting visitors keep with existing trails to minimise indiscriminate trampling.
- Liaise with the local government authority, the Ministry for Planning and Main Roads WA to monitor any disturbance or development within the catchment to ensure that general land management activities do not negatively impact on the environment.
- Monitor the ongoing state of the riverine vegetation health, preventing any weed species from becoming established.
- Remove individual eastern states wattles prior to flowering and fruiting this year.



<p>abundant <i>Dryandra nivea</i> (Couch Honeypot), <i>Hibbertia spicata</i> (Yellow Buttercups), <i>Juncus pallidus</i> (Pale Rush), <i>J. subsecundus</i> (Finger Rush), <i>Baumea juncea</i>, <i>B. rubiginosa</i> (River Twig), <i>Lepidosperma tetraquetrum</i> (Angle Sword Sedge) and <i>L. effusum</i> (Spreading Sword Sedge). There are also frequent occurrences of <i>Hovea chorizemifolia</i> (Holly-Leaved Hovea), <i>Dampiera alata</i>, <i>Baeckea camphorosmae</i> (Camphor Myrtle), <i>Lechenaultia biloba</i>, <i>Borya sphaerocephala</i>, <i>Leucopogon</i> sp. (Bearded Heath) and <i>Drosera microphylla</i>. There is one isolated occurrence of an introduced Wattle species (<i>Acacia</i> sp.).</p>	
<p>Stream Cover: There is abundant stream cover afforded by the streamside and instream vegetation. Much of the instream vegetation is made up of a variety of rushes and sedges. There is also abundant instream cover afforded by leaf litter and branches, with occasional occurrences of rocks.</p>	<ul style="list-style-type: none"> • Monitor the health of the waterway regularly to ensure early signs of weed invasion are recognised and acted on.
<p>Habitat diversity: There is no permanent water within the creek. At the time of survey there was no water in the upper reaches of this creek, despite recent rainfall events. The amount of water within the creek increases further downstream. The lack of water is to be expected as the section is located in the headwaters of the creek line. The water quality is high, with no obvious turbidity or signs of salinity. The diverse vegetation structure creates a wide range of habitats for the terrestrial organisms of the area. There is evidence for the existence of frogs, kangaroos and bandicoots.</p>	<ul style="list-style-type: none"> • Monitor native species diversity and ensure prompt action to control any weed disturbances.
<p>Other issues: Care should be taken to ensure that weed species do not invade the area from the nearby road verge.</p> <p>It is important that people who are aware of this site should protect its values by not moving into or through this area in an uncontrolled manner. This site can be a model for revegetation works downstream, and it is critical that its values are protected.</p>	<ul style="list-style-type: none"> • Liaise with Main Roads WA to conduct ongoing maintenance of the roadside verges, removing weed species and any accumulated rubbish. • Install signage to encourage any visitors to this site to clean their boots and clothes thoroughly to prevent inadvertent introduction of disease or weeds. • Ensure that any organised community activities minimise the number of people entering this area to protect it from disturbance and trampling of the vegetation. • Encourage the local government authority to install bollards and woodchip guideways to limit indiscriminate trampling of native vegetation.



Helena – Site 1: Maps 1-3, 6-9 (Section B) Bending Gully Creek

Length of section (m): 2200 m
Recorder's name: B Waining
Date surveyed: 6/7/99
Nearest road access: Mundaring Weir Road
Lot number(s): 2, 3717, 4898, 12545, 12544, 1037

Summary of river health:

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Yellow	Yellow	Yellow	Red
Moderate	Moderate	Moderate	Poor
4	4	4	2

Stream Condition
Yellow
Moderate
14

Description

Bank stability: The impact on bank stability from encroaching development resulting in increased disturbance is highlighted along this section of Bending Gully. The stream along this section is up to 1.5 m wide, with localised areas of erosion evident along 5-20% of the foreshore with minimal slumping occurring. Further, 5-20% of the stream is showing signs of sedimentation. A number of small dams constructed within the creekline affect downstream flow and act as sedimentation ponds. The creek passes through a number of culverts under service roads, driveway entrances and the exit points of many of the dams. There are also some stormwater pipes entering the stream from road sides. Areas of bank development/enhancement have been created through soil and rock dumping, and moulding. This has resulted in subsequent bank destabilisation in localised areas. Grazing cattle that freely access the creek within the area defined by Map 8 may also be contributing to the degradation of the bank stability and the lack of natural regeneration within this area. There is also a crossing point (used by vehicles) which, due to the lack of a culvert, is contributing to bank destabilisation and is acting as a sediment source to the creek.

Recommended Strategies

- Stabilise the reconstructed banks, with appropriate soft engineering and revegetation techniques (Appendix 4 and Appendix 3).
- Encourage the local government authority to formalise the crossing point using open structures, which do not impede water flow.
- Fence off areas of revegetation and along areas where stock currently have access to the creekline, to prevent soil compaction and modification.
- Encourage landholder(s) to create offline stock watering points to negate the need for stock to access the creekline.
- Revegetate the banks of the creek where little to no native vegetation exists, using common locally occurring species (Appendix 3). Tubestock or seed used in this area should be regionally specific.
- Restore instream rushes and sedges along dam walls to increase nutrient retention and improve soil stability.
- Liaise with the Water and Rivers Commission to assess the impact of the dams on stream flow and determine whether or not provision needs to be made to maintain environmental flows.



Vegetation: The overstorey of this section is patchy covering 20-80% of the section. *Corymbia calophylla* (Marri) and *Eucalyptus marginata* (Jarrah) occur frequently while *E. laeliae* (Darling Range Ghost Gum) and *E. rudis* (Flooded Gum) are less common. Non-native overstorey species include Radiata Pine (*Pinus radiata*), introduced Wattles (*Acacia* spp.) and two other introduced tree species, which occur occasionally to frequently along the section. There are infrequent occurrences of Willows (*Salix* sp.). The patchy middlestorey is characterised by frequent occurrences of *Trymalium ledifolium*, *Agonis linearifolia* (Swamp Peppermint) and the rush *Lepidosperma tetraquetrum*. Occasional occurrences of *Acacia pulchella* (Prickly Moses), *Grevillea glabrata* (Smooth Grevillea) and *Viminaria juncea* (Swishbush) are also present. Weed species occurring frequently to occasionally within the middlestorey include Pampas Grass (*Cortaderia selloana*), Giant Reed (*Arundo donax*) and Bracken Fern (*Pteridium esculentum*). There are also a few occurrences of the introduced Bulrush (*Typha orientalis*) and *Cyperus* sp. within the middlestorey. The understorey of this section is relatively continuous, however 70% of this cover comprises introduced species. There are patchy occurrences of native species including occasional *Acacia alata* (Winged Wattle), *Hibbertia spicata* (Yellow Buttercups), *Dryandra nivea* (Couch Honeypot), *Darwinia citriodora* (Lemon Scented Darwinia) and *Hakea lissocarpa* (Honeybush). There are some occurrences of a range of rushes and sedges within Section B. As stated, the dominant species of the understorey are weeds, including frequent occurrences of Bridal Creeper (*Asparagus asparagoides*), *Watsonia* (*Watsonia bulbifera*), Soursob (*Oxalis pes-caprae*) and a range of annual grass species. Some of the grasses present include Kikuyu (*Pennisetum clandestinum*), Guildford Grass (*Romulea rosea*) and *Paspalum* sp. Some areas within this section are devoid of any native vegetation cover, including an area within Map 6 of planted lavender gardens.

- Work with the local government authority and the Water and Rivers Commission to ensure any future bank enhancement, with the use of soil and rock dumping and moulding, is to be done with minimal impact on the hydrology of the stream.

- Undertake weed control activities in accordance with suggested techniques to ensure no further bank destabilisation takes place.
- Focus control on highly invasive weeds such as *Watsonia*, Bridal Creeper and Giant Reed using suggested techniques in Appendix 2.
- Revegetate banks and creek line with appropriate species using species already occurring and those listed in Appendix 3.
- Undertake regular monitoring of the vegetation of the area to ensure there is no further encroachment of Radiata Pine from the adjoining plantation.
- Using appropriate techniques, remove the Willows and other weed species with the potential for large scale spread such as Pampas Grass.
- Implement progressive replacement of overstorey by planting indigenous species (Appendix 3), maintaining weed control activities around planted zones and ultimately poisoning and removing the Willows and other introduced tree species.
- Monitor for suckers and regrowth from removed stumps.
- Focus weed control in areas where assisted regeneration is occurring and also on species with small populations such as Giant Reed (Appendix 2).
- Treat grasses including Kikuyu and *Paspalum* with selective herbicides such as flauzifop-butyl.
- Monitor lavender gardens to ensure that garden escapes do not enter the riparian zone.



Stream cover: The overall sparse and patchy nature of the overstorey and middlestorey within this section still provides relatively frequent stream cover, as the vegetation occurs mostly on the edge of the channel, with occasional cover provided by exotic vegetation. There are deciduous trees present along the section, which will decrease the level of cover during seasonal leaf fall. Instream cover is provided by leaf litter, rocks, branches and vegetation. Some of the rocks have arrived within the creek after becoming dislodged from the constructed bank areas during peak flow events or as a result of vandalism.

Habitat diversity: There is no permanent water within this section of the creek. The water depth at the time of survey was approximately 15 cm, and was relatively constant for the length of the section. There was little in the way of pool development, apart from the constructed dams along the upper reaches of Section B. There is a variety of vegetation and protected basking sites along the section, which provide habitat for terrestrial and aquatic organisms. There is evidence for the existence of frogs, kangaroos and bandicoots. There are also cows within this section, with uninhibited access to the creek within the area of Map 8.

Other issues: A range of disturbance factors impact on this tributary of the Helena River. These include inappropriate disposal of garden refuse, service corridors (which may be a source of runoff to the stream), dams, grazing stock and water extraction pumps. The orchards along the creekline may also be contributing to the overall degradation of this section, due to the potential presence of fertilisers, herbicides and pesticides often associated with the cultivation of orchard species.

Further, the environmental flows are likely to have been significantly reduced as a result of the extensive damming along this tributary.

- Retain instream cover features where they do not threaten foreshore stability.
- Re-establish native rushes and sedges along the banks and within the creek line.
- Enhance stream cover and habitat value with the replacement of native vegetation in areas where it has been removed.
- Control extent and number of deciduous trees with an ultimate goal of replacement with indigenous tree species.

- Retain habitat features such as branches, logs and rocks within the creek and along the banks.
- Encourage local landholders to vegetate their dam walls with indigenous fringing vegetation, many of which have been planted with exotic species such as Cactus and Radiata Pine.
- Provide an information leaflet to local landholders outlining the benefits of planting local nectar species to encourage native wildlife to utilise the area, which improves aesthetics (Appendix 3).
- Implement a community conservation plan, which will contribute to the conservation of local species and augment the upstream Department of Conservation and Land Management reserve.
- Create offline stock watering points to negate the need for stock to access the creekline.

- Remove collections of garden refuse and soil dumps, to prevent any further species establishing within the riparian zone.
- Provide information leaflets to landholders adjoining Bending Gully Creek encouraging protection of the foreshores, native vegetation, nutrient management and techniques to minimise other potential impacts.
- Control stock access to the creek.
- Liaise with the Department of Environmental Protection and the Water and Rivers Commission to assess potential chemical residue within the riparian zone, especially proximal to the orchard area.





- Liaise with the Water and Rivers Commission regarding the legality of water containment (damming) as it relates to riparian water rights in the area under the *Rights in Water and Irrigation Act, 1914*.
- Liaise with the local government authority, the Water and Rivers Commission and the Ministry for Planning to ensure that all existing and potential future dams and ponds constructed along the creek, meet with stipulated conditions of construction and design.

Helena – Site 1: Maps 4-6 (Section C) Bending Gully Creek

Length of section (m): 1200 m

Recorder’s name: B Waining

Date surveyed: 6/7/99

Nearest road access: Mundaring Weir Road

Lot number(s): Fred Jacoby Reserve, 2621, 1001 and 964

Summary of river health:

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Yellow	Red	Red	Black
Moderate	Poor	Poor	Very Poor
4	2	2	0

Stream Condition
Red
Poor
8



Description

Bank stability: This section of the creekline is within the Department of Conservation and Land Management Fred Jacoby Reserve and the foreshore area is highly modified. This reserve consists of large areas of maintained lawns, with scattered trees present. There are picnic facilities. The majority of the creekline (approximately 90%) is contained within an artificial channel, which is approximately 1 m wide and 1 m deep, constructed with cemented rocks. Some sections of the channel show signs of poor maintenance, where rocks have been dislodged from the banks and/or base of the channel. There are localised areas of erosion along the channel and downstream near a dam outflow point. There are also signs of gullying at stormwater outflow sites, and localised erosion from runoff from the gravel parking bays close to the bank of the dam. Localised areas of sedimentation and some minimal slumping are evident along this section of creek.

Vegetation: The vegetation along this highly modified foreshore area comprises large expanses of grassed lawns. Randomly interspersed throughout the area are a number of exotic trees and planted natives. Patches of native vegetation can be found in isolated occurrences along the stream. The overstorey and middlestorey are both sparse with native species comprising only 50% and 20% respectively, of the vegetation present. Within the overstorey the dominant species are *Corymbia calophylla* (Marri) and *Eucalyptus marginata* (Jarrah), with infrequent *Melaleuca raphiophylla* (Swamp Paperbark) present. The remainder of the overstorey is represented by randomly placed weed tree species such as Oaks (*Quercus* sp.), introduced Wattles and Radiata pine (*Pinus radiata*). The sparse middlestorey is characterised by a few occurrences of a range of species including *Agonis linearifolia* (Swamp Peppermint). Weed species such as Blackberry (*Rubus fruticosus*), Bracken Fern (*Pteridium esculentum*), and the Giant Reed (*Arundo donax*), comprise the majority of the middlestorey. Mowed grasses, *Watsonia* (*Watsonia bulbifera*),

Recommended Strategies

- Develop a management plan which investigates opportunities to restore the bank structure and slow water movement.
- Replace much of the weed infested sections of vegetation along the channel with appropriate native species, whilst maintaining the recreational values of the area.
- Erect signs explaining the revegetation efforts, and how these efforts may benefit overall river health.
- Erect fencing to protect newly vegetated sections.
- Maintain channel banks, to prevent collapse and potential scouring/erosion of the banks.
- Liaise with the local government authority, Main Roads WA and the Water and Rivers Commission to investigate ways to improve drainage from parking areas through use of water sensitive urban design principles, to aid in decreasing potential water and sediment loads within the creek.

- Revegetate areas of degraded or denuded vegetation with appropriate, locally derived native species (Appendix 3).
- Undertake weed control, and implement an ongoing weed management program (Appendix 2).
- Ensure a control program for the noxious weeds present, such as Blackberry, *Watsonia*, Cotton Bush and Bridal Creeper, is established and implemented. This will be required for the immediate area of the creekline and extending up into the surrounding forest and plantation, where Bridal Creeper is becoming a major problem.
- Erect fencing to protect newly revegetated areas from trampling.
- In areas where no channel exists, establish native fringing vegetation and remove invasive weed species.
- Improve continuity of vegetation along the streamline and extending to neighbouring bushland to encourage natural regeneration and improved habitat for fauna.



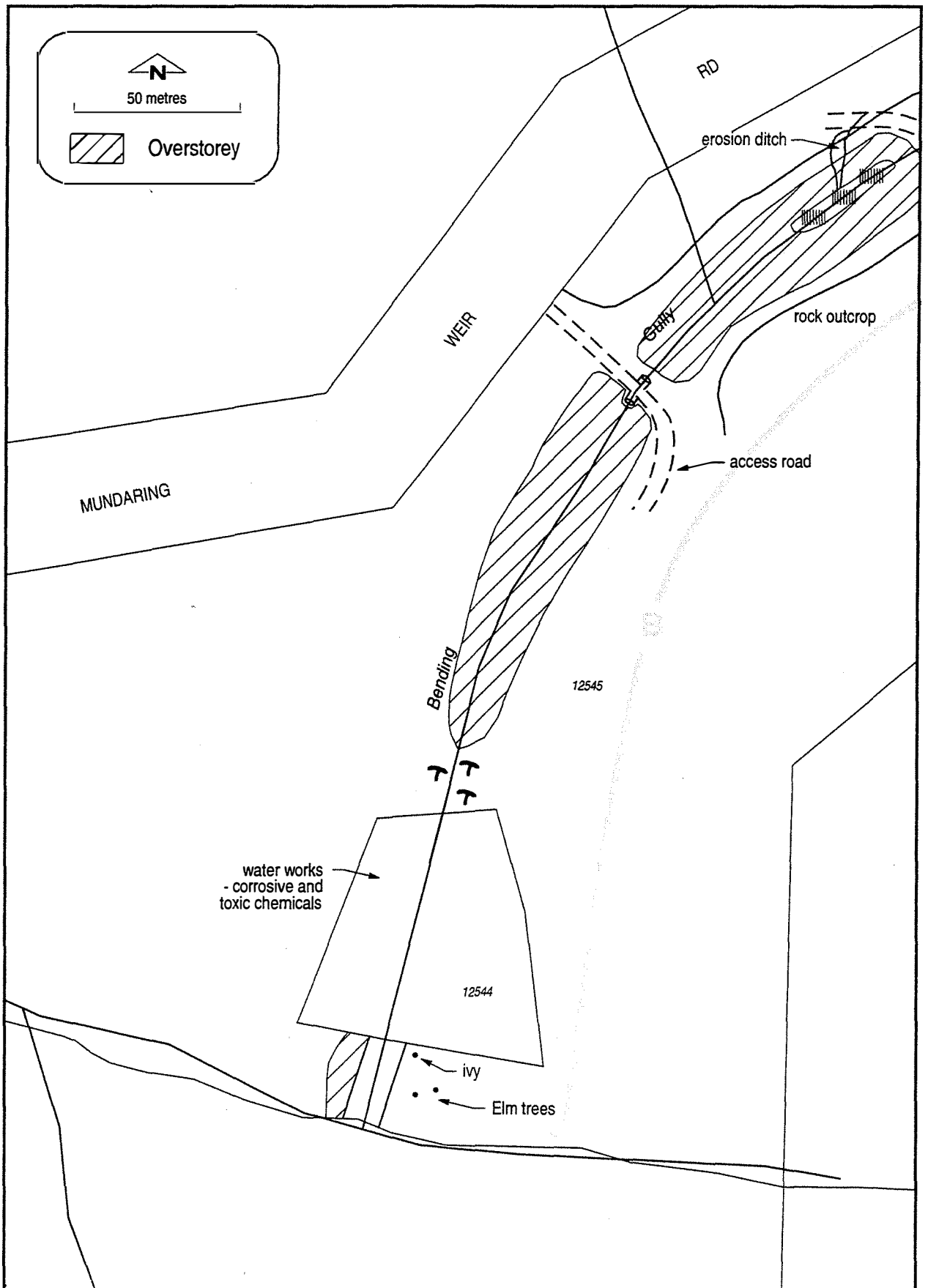
<p>Soursob (<i>Oxalis pes-caprae</i>), Cotton Bush (<i>Gomphocarpus fruticosus</i>) and exotic creepers including Bridal Creeper (<i>Asparagus asparagoides</i>) dominate the understorey. Some species of identified weed grasses include Kikuyu (<i>Pennisetum clandestinum</i>), <i>Paspalum</i> spp. and Guildford Grass (<i>Romulea rosea</i>). There are persistent native plant species including infrequent occurrences of <i>Hibbertia spicata</i> (Yellow Buttercups), <i>Dryandra nivea</i> (Couch Honeypot), <i>Hypocalymma angustifolia</i>, <i>Acacia alata</i> (Winged Wattle) and <i>Macrozamia reidleyi</i> (Zamia).</p>	
<p>Stream Cover: Due to the sparse and patchy nature of the vegetation of this section, there is little available stream cover. There are some small patches of good stream cover, however these areas are often associated with degraded sections of the bank. The nature of the constructed channel does not facilitate the provision of good instream cover, although some leaf litter from the deciduous Oaks and Cork Trees of the park persists.</p>	<ul style="list-style-type: none"> • Plant manageable native overstorey, middlestorey and understorey species selected from Appendix 3 to improve habitat. • Remove sections of grass and lawn and replace with indigenous species.
<p>Habitat diversity: The depth of water shows little variation, with some shallow zones where the channel lacks constructed walls. There is one dam constructed within the park, which may provide some habitat refuge for aquatic organisms. Some frogs were observed close to the dams. There is limited habitat along the edges of the channel, although some patches of vegetation provide small, isolated refuges. There are a number of instream dam-like structures, which act as riffles and disrupt flows along the creek. Nesting boxes have been provided on some trees.</p>	<ul style="list-style-type: none"> • Re-establish areas of the stream with natural banks and bottom, ensuring sufficient revegetation has taken place to stabilise the banks. • Retain instream features such as rocks, logs and branches. • Establish wildlife corridors from the creek to the area of natural bushland above the park. • Increase the extent and diversity of native vegetation surrounding the dam.



Other issues: There is rubbish present within the park, most probably due to the fact that bins are not provided as part of the management of the park. The Department of Conservation and Land Management has a general policy to not provide rubbish bins, to encourage park users to take their rubbish home. There are some signs explaining the heritage of the Oak trees in the area. The main creek line is very hydrologically disturbed, with the complete removal of at least one of the tributaries of the creek and the re-alignment of the main channel. The area has a high recreational usage, with the provision of tables and BBQ facilities, large open grassy areas and the opportunity to walk in the bushland surrounding the park. There are also signs provided for the park users with information on some of the historical aspects of the reserve. The management of this recreational reserve is determined by the Department of Conservation and Land Management's general district policy, in accordance with the park being rated as a multiple use area. Therefore any weed control activities undertaken are on district prioritisation, with conservation reserves taking the highest priority.

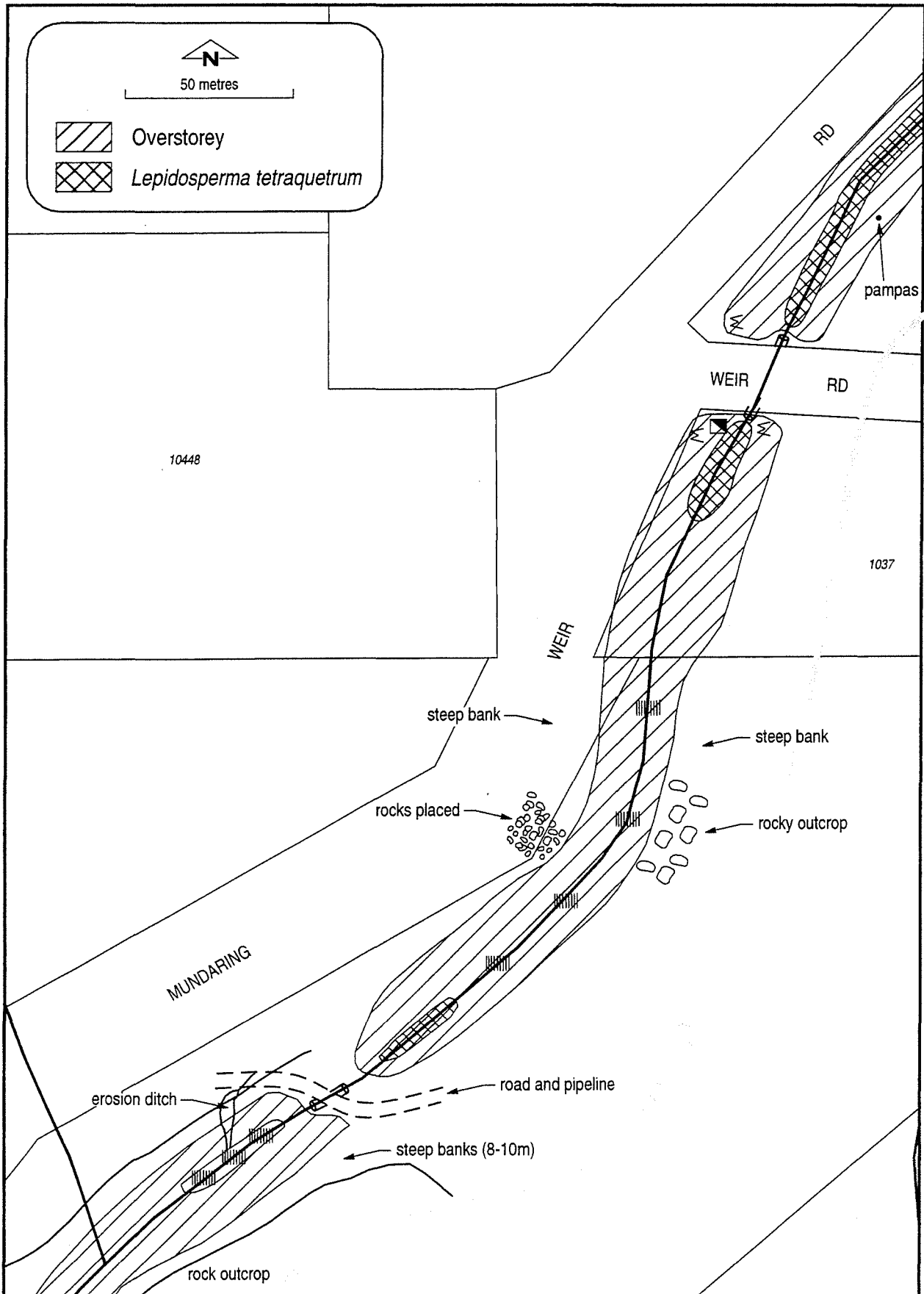
- Liaise with the Department of Conservation and Land Management to amend park policy to include the provision of rubbish bins.
- Provide additional signs explaining the benefits of maintaining healthy native vegetation along riparian areas.





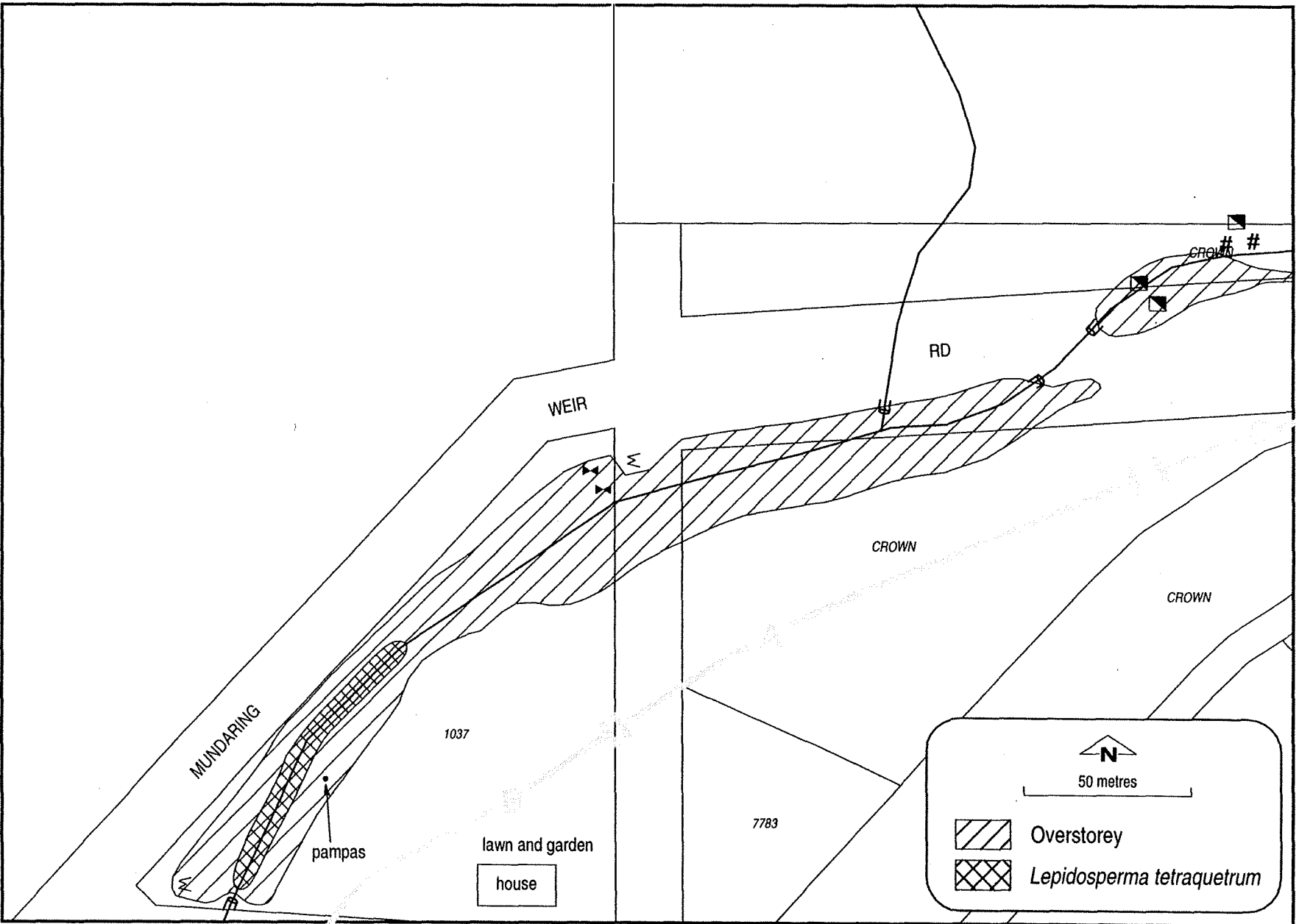
Bending Gully Creek Site 1: Map 1 (Section B)



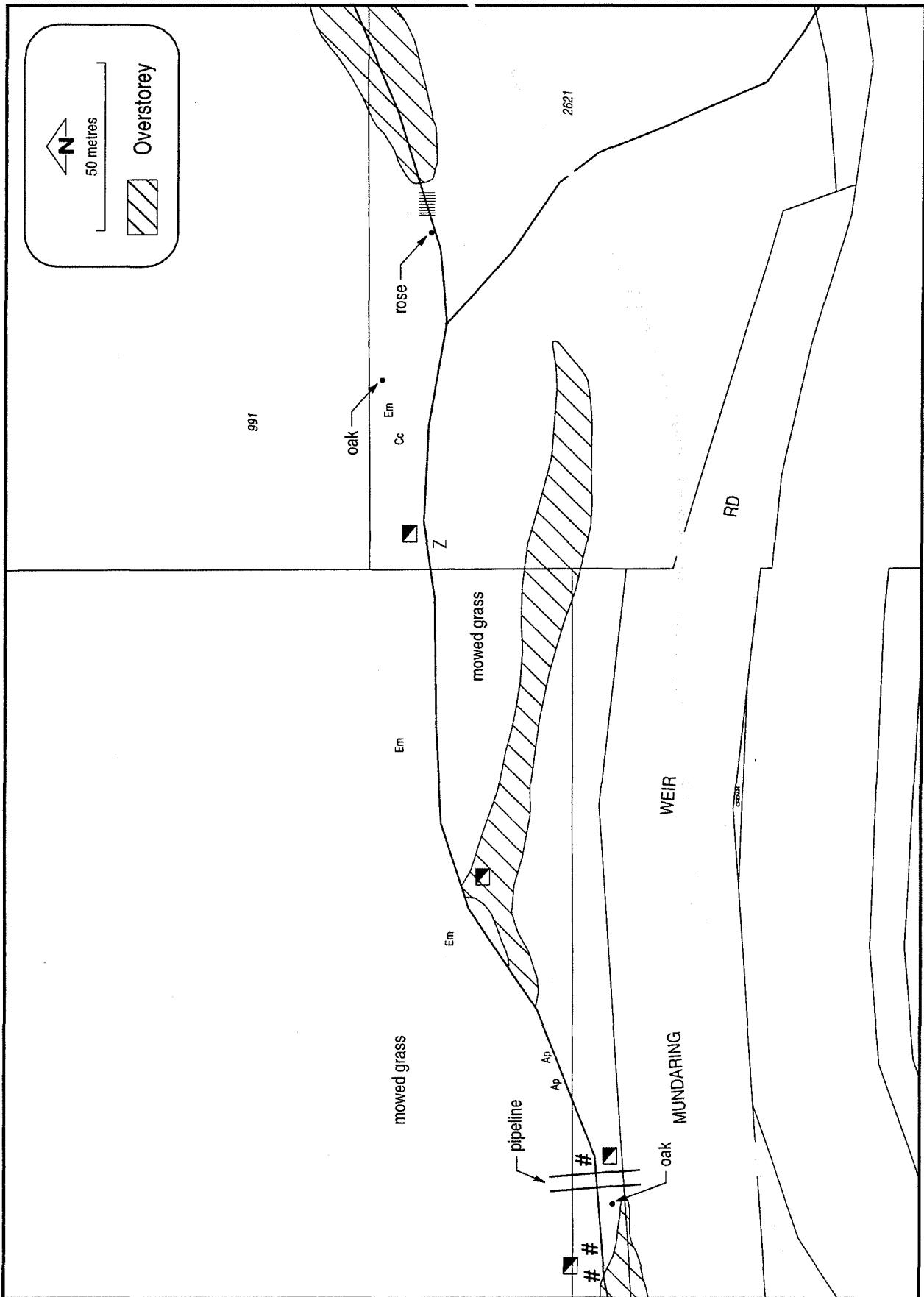


Bending Gully Creek Site 1: Map 2 (Section B)



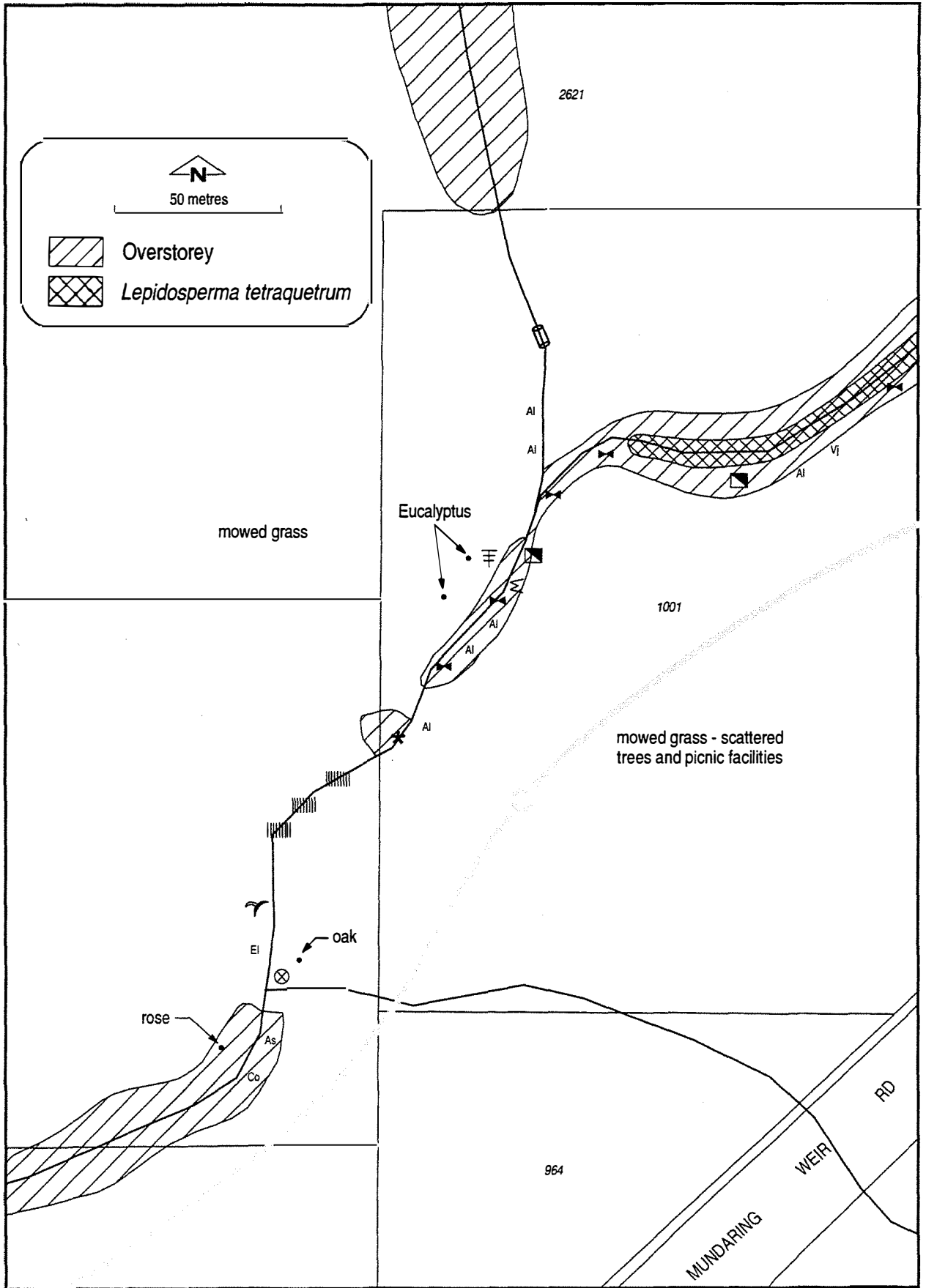


Bending Gully Creek Site 1: Map 3 (Section A, Part B & Part C)



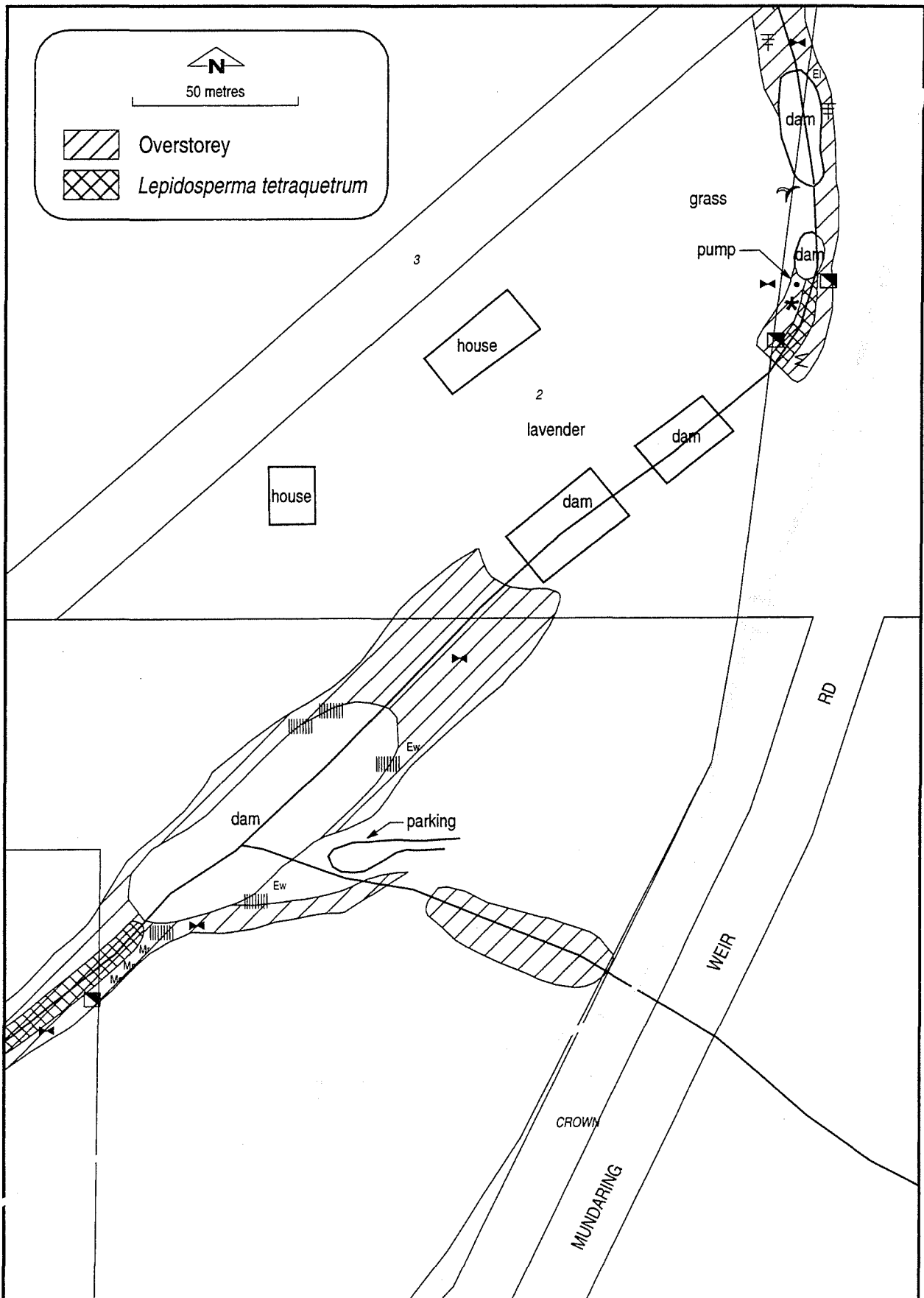
Bending Gully Creek Site 1: Map 4 (Section C)





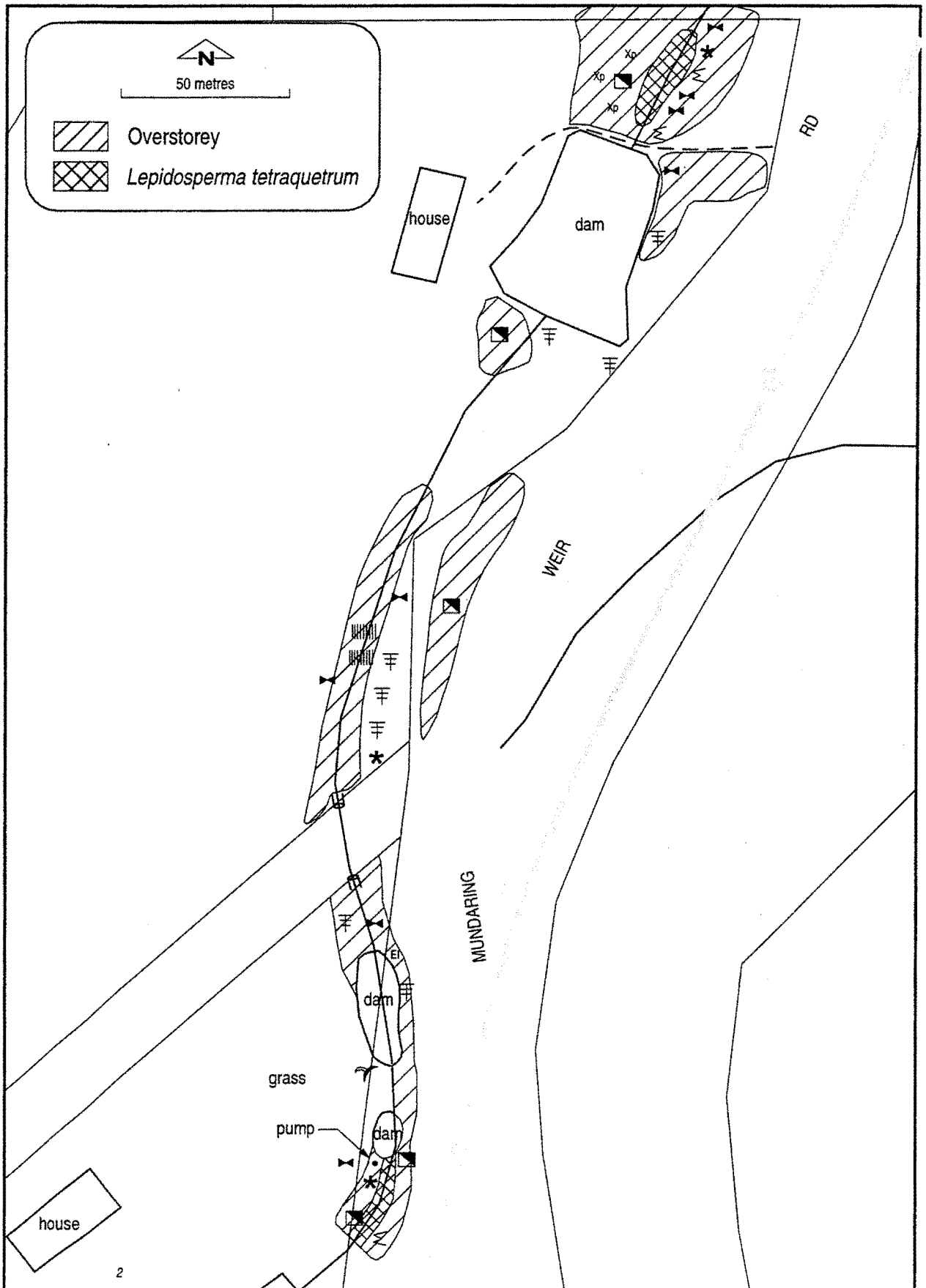
Bending Gully Creek Site 1: Map 5 (Section C)





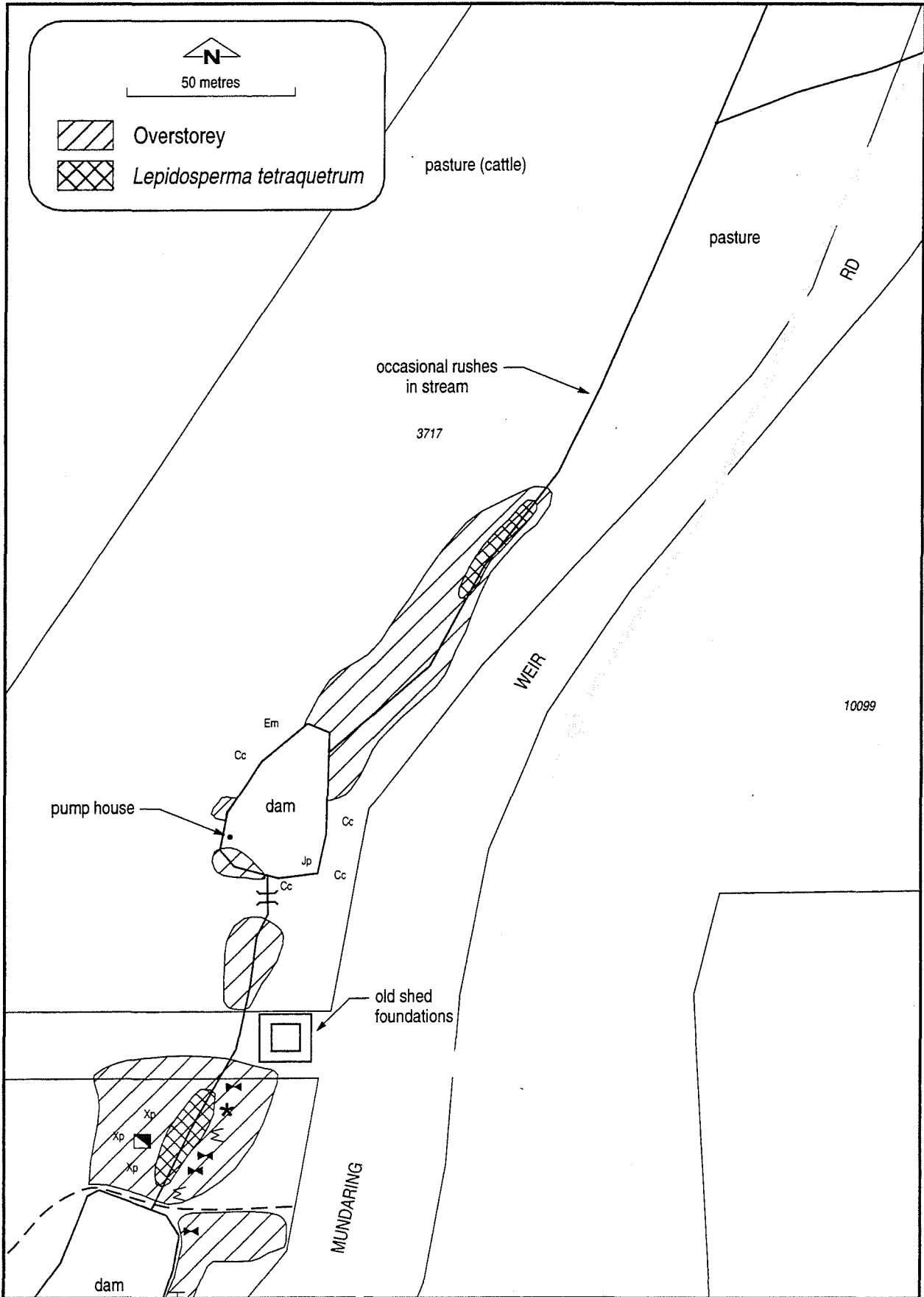
Bending Gully Creek Site 1: Map 6 (Part Section B & Part C)





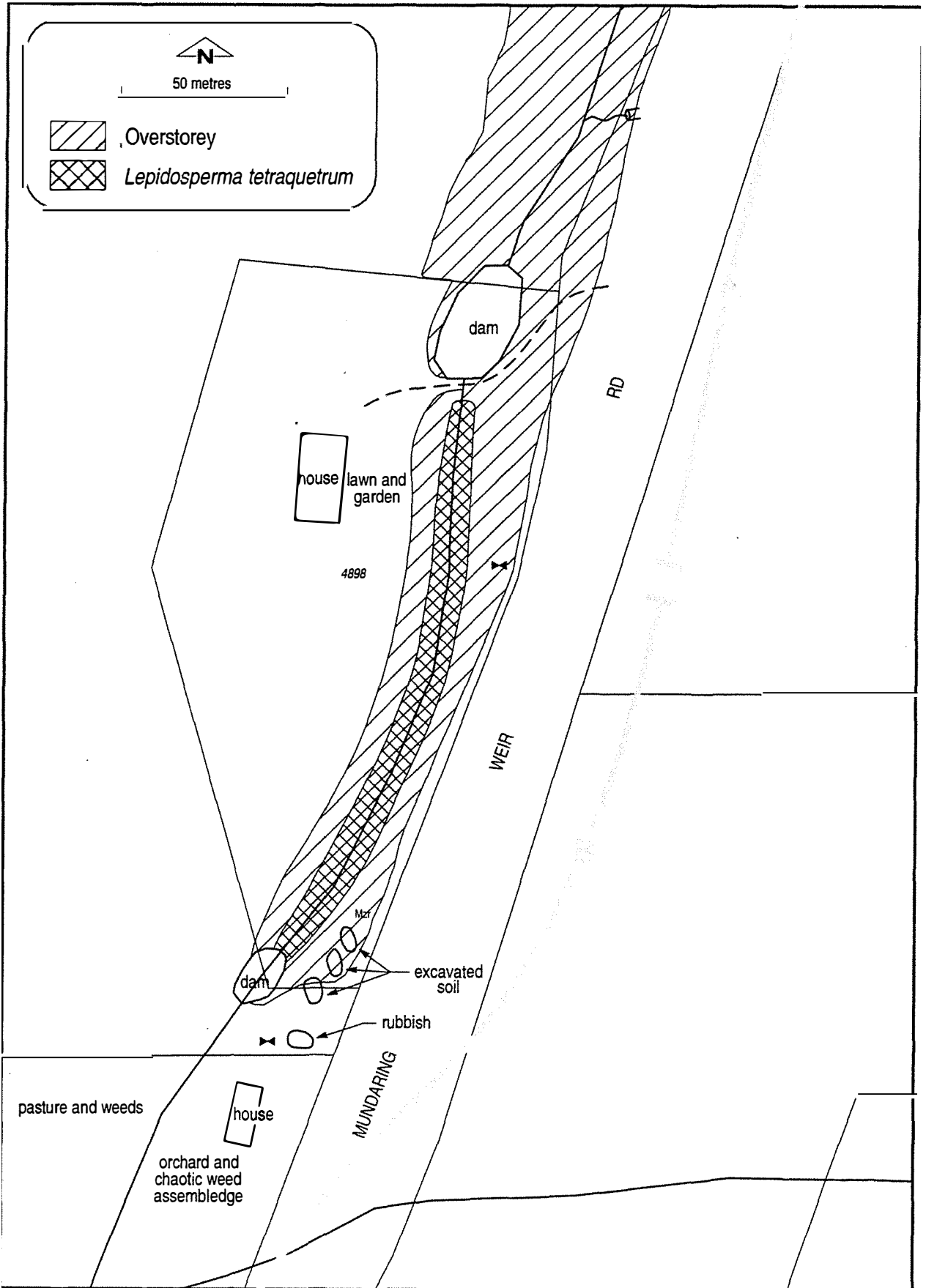
Bending Gully Creek Site 1: Map 7 (Section B)





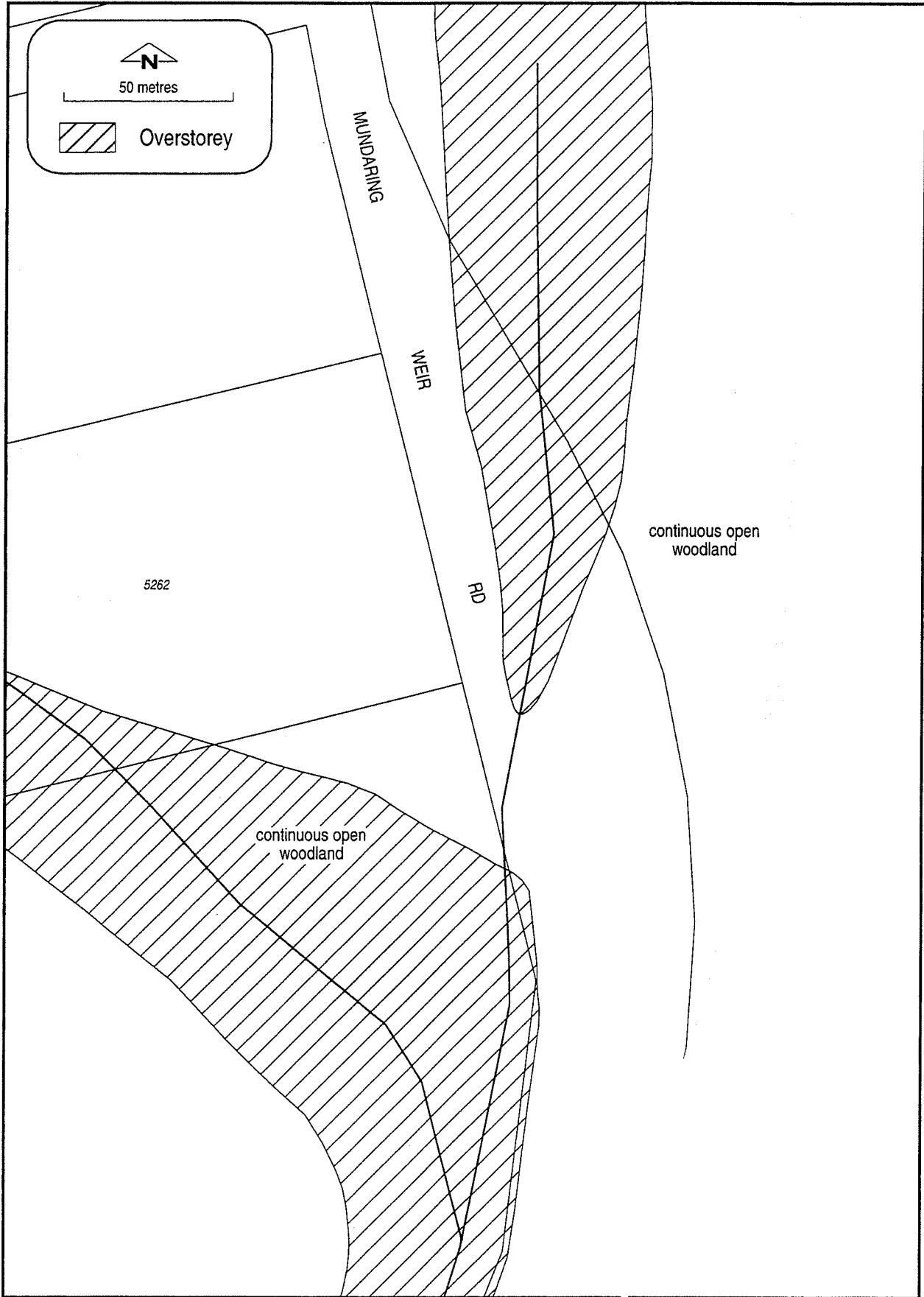
Bending Gully Creek Site 1: Map 8 (Section B)





Bending Gully Creek Site 1: Map 9 (Part Section A & Part B)





Bending Gully Creek Site 1: Map 10 (Section A)



4.2 Fred Jacoby Reserve

Bending Gully Creek

Results

Foreshore Condition Survey

A Study undertaken on behalf of
Water and Rivers Commission and the Natural Heritage Trust



Helena – Site 1B: Map 1-4 Fred Jacoby Reserve, Bending Gully Creek

Length of section (m): 1280 m
Recorder's name: B Waining
Date surveyed: 7/7/99
Nearest road access: Mundaring Weir Road
Lot number(s): CALM – Fred Jacoby Reserve 2621, 1001

Summary of river health:

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity	Stream Condition
Yellow	Yellow	Yellow	Yellow	Yellow
Moderate	Moderate	Moderate	Moderate	Moderate
4	4	4	4	16

Description

Bank stability: This survey section extends from the parkland of the Fred Jacoby Department of Conservation and Land Management reserve (Site 1, Section C), upslope into the bush reserve. The creek bed is up to 2 m wide and 20 cm deep. The banks of the creek are steep, between 45° and 60°, and display only localised areas of erosion. There is minimal slumping evident along the creek. There are significant areas of sedimentation, with up to 50% of the section affected. Much of this sediment appears to come from the surrounding gravel access tracks, which do not have sufficient drainage capabilities, and have therefore eroded and deposited the finer sands into the creek.

Vegetation: The open dry woodland characterising this vegetation complex is relatively undisturbed, with good regeneration following a fire. The cover is patchy (20-80%) and is provided by all three strata of vegetation. There are very few weed species in this area with scattered introduced Wattles (*Acacia* sp.), Shivery Grass (*Briza minor*) and Bridal Creeper (*Asparagus asparagoides*) evident. The overstorey is dominated by the abundant distribution of *Corymbia calophylla* (Marri) and *Eucalyptus marginata* (Jarrah). Some trees are displaying signs of disease or stress in the upper sections, with noticeable loss of the

Recommended Strategies

- Encourage the local government authority to address bank destabilisation at the lower section of the creek, where the pipeline passes over. Revegetate as required, or use a combination of soft engineering methods and revegetation/fencing (Appendix 4 and Appendix 3).
- Liaise with the Department of Conservation and Land Management, Main Roads WA, the Water and Rivers Commission and the local government authority to construct adequate drainage features along the tracks of the area; use silt/sand traps where necessary.
- Erect signs encouraging walkers to keep to formed paths, directing them away from the stream banks.
- Revegetate the southern portion of the creek, where it passes over the track and under the pipeline.
- Determine the cause of decline of Eucalypts in the area (such as Phytophthora, encroaching salinity or insect damage, to name a few). Address the problem as required. Contact the Department of Conservation and Land Management and AGWEST for advice.



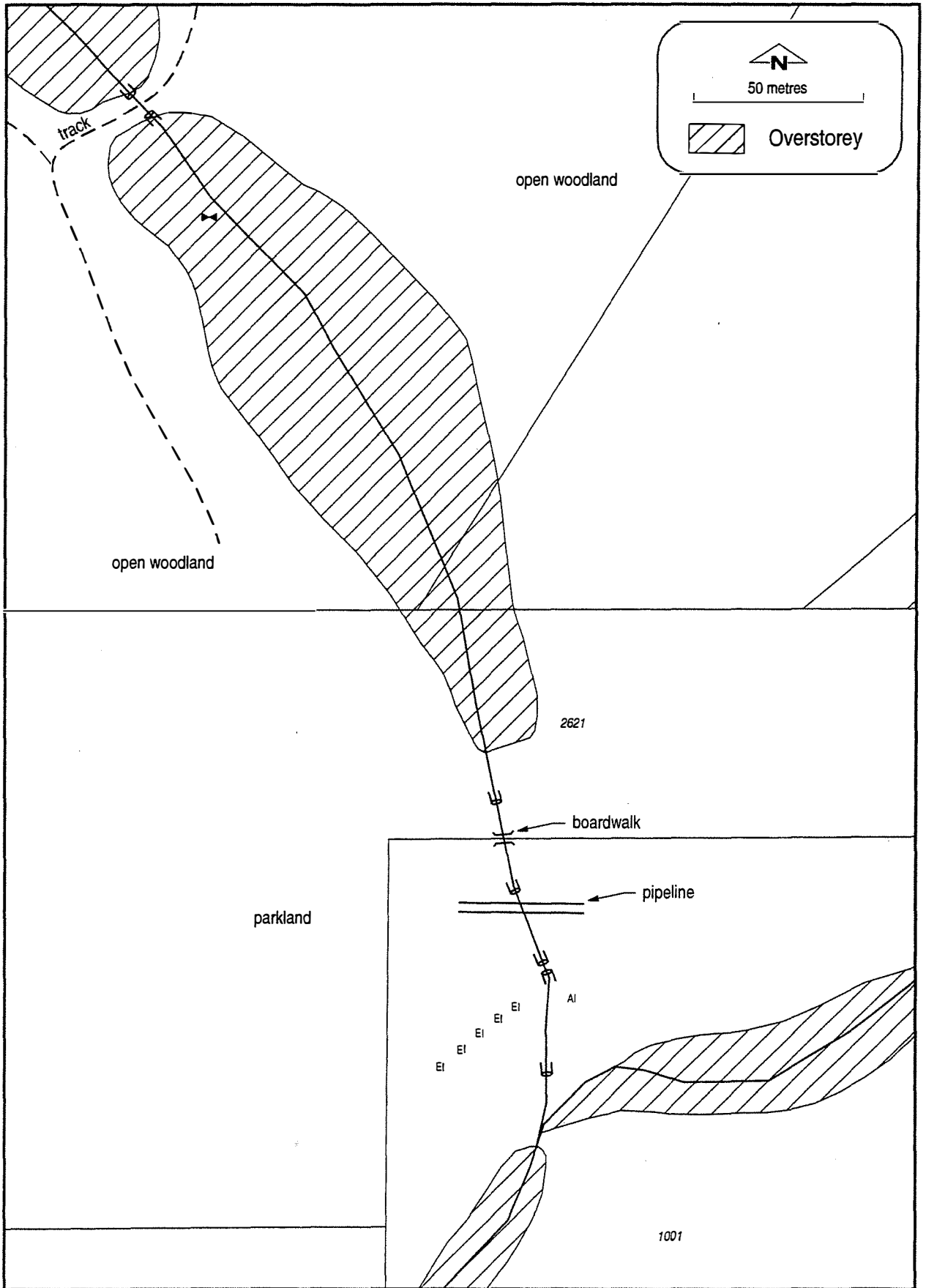
<p>upper leaves. There is also an occasional occurrence of <i>E. wandoo</i> (Wandoo), in the upper reaches of the creek line. The middlestorey includes abundant <i>Xanthorrhoea preissii</i> (Grass Tree) and frequent <i>Agonis linearifolia</i> (Swamp Peppermint), <i>Trymalium ledifolium</i> and <i>Acacia pulchella</i> (Prickly Moses). The middlestorey includes occasional, but regular, occurrences of <i>Astartea fascicularis</i> (Common Astartea), <i>Hypocalymma angustifolium</i> (White Myrtle), <i>Viminaria juncea</i> (Swishbush), <i>Hakea amplexicaulis</i> (Prickly Hakea) and <i>Grevillea glabrata</i> (Smooth Grevillea). There are a number of other native middlestorey species ranging in frequency of occurrence from occasional to infrequent (Appendix 1). The understorey of this section is intact. It is characterised by frequent occurrences of species including <i>Dryandra nivea</i> (Couch Honeyypot), <i>Hibbertia spicata</i> (Yellow Buttercups), <i>Macrozamia reidleyi</i> (Zamia), <i>Juncus kraussii</i>, <i>Borya sphaerocephala</i>, three species of <i>Leucopogon</i> sp. and Sundews <i>Drosera microphylla</i> and <i>D. glandulosa</i>. There are also frequent occurrences of a number of rush and sedge species.</p>	<ul style="list-style-type: none"> • Work to eradicate current weed invasion. Hand weed introduced Wattles and Blowfly Grass and removing the bulk of Bridal Creeper prior to herbicide treatment. • Monitor weed invasion, especially from the track margins, and continue control as necessary.
<p>Stream Cover: There is abundant stream cover offered by the fringing vegetation growing along this section of the stream. Leaf litter, branches and occasional rocky sections also provide cover.</p>	<ul style="list-style-type: none"> • Work to protect the natural state of the creekline, through actions such as limiting access.
<p>Habitat diversity: There is no permanent water in this creekline. At the time of this survey there was water in the lower sections of the creek, while the upper sections were devoid of water, despite recent rainfall events. There is a diversity of habitat offered by the surrounding vegetation and landforms. The water in the stream is of reasonable quality with only minor turbidity noticeable. There are obvious signs of kangaroos, frogs (including egg sacs), various bird species and bandicoots.</p>	<ul style="list-style-type: none"> • Retain all fallen branches, logs and other material for habitat value.



Other issues: This area of bush is highly accessible to the users of the parkland reserve, and is potentially subject to widespread trampling and disturbance. The tracks that do service the area are made from gravel and are poorly formed, with few drainage and culvert features. This has led to the formation of gullies and is contributing to the sediment load within the stream. There are some signs along the paths. In the upper reaches of this creek section the main channel branches frequently until it becomes quite indistinct. There is evidence (ash soils, blackened bark) of a recent fire through this region.

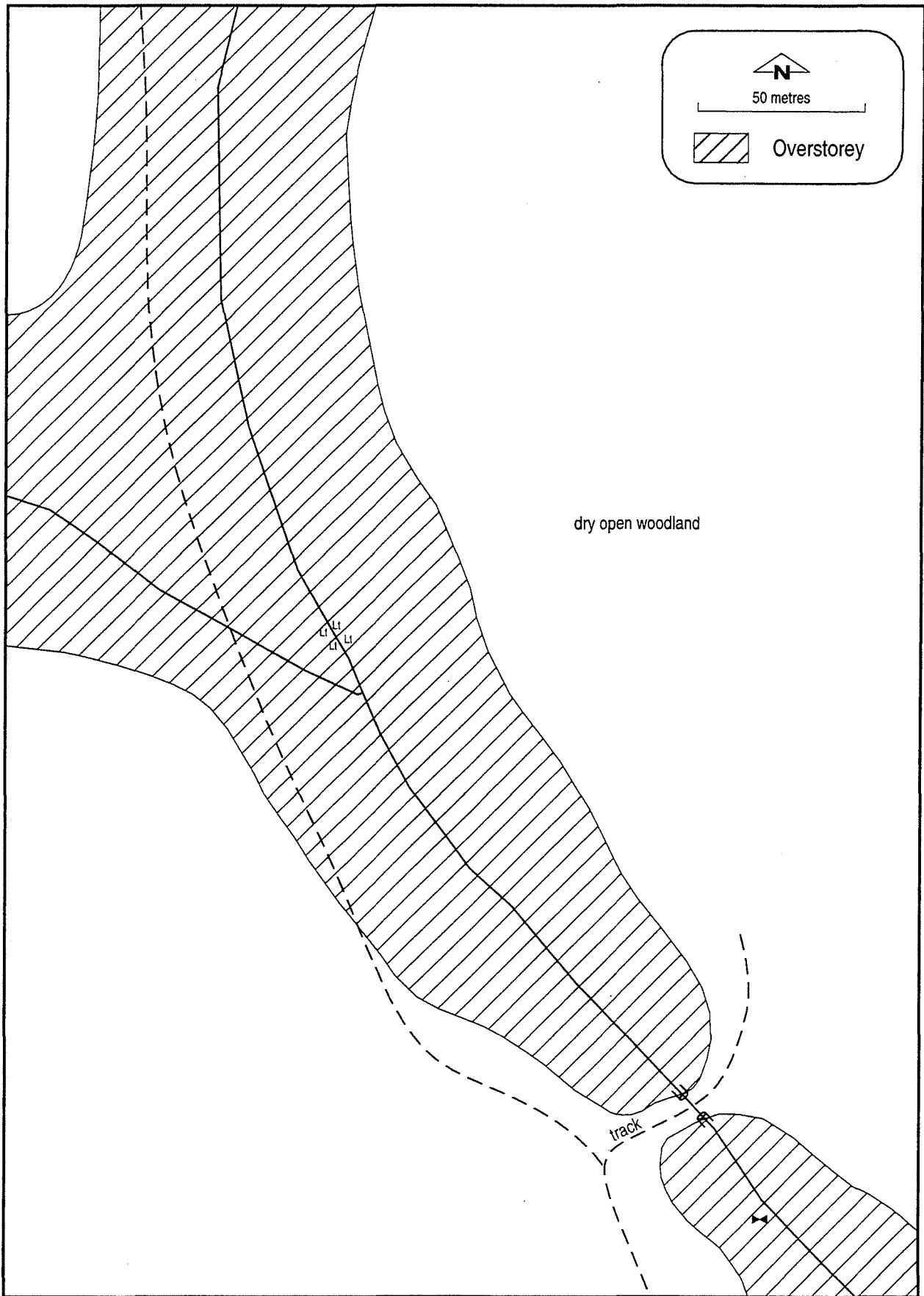
- Erect more signs to direct people along the formed tracks, in an effort to protect the bush.
- Rationalise and improve the walk trails through the area using signage, guideways and bollards.
- Work with the Department of Conservation and Land Management to rationalise the track network ensuring sufficient access for fire fighting, and install mini-interceptor banks to collect water in local areas. Note that this needs to be undertaken carefully to minimise the risk of exacerbating conditions conducive to Phytophthora.
- Revegetate any unnecessary access tracks.
- Liaise with the Department of Conservation and Land Management and the Fire & Emergency Services Authority of WA to ensure a comprehensive fire management plan is maintained. Inform all parties of any changes to access as tracks are closed.
- Encourage the Department of Conservation and Land Management to utilise water sensitive urban design techniques to control stormwater runoff.
- Encourage the use of soft engineering techniques to stabilise areas of erosion.





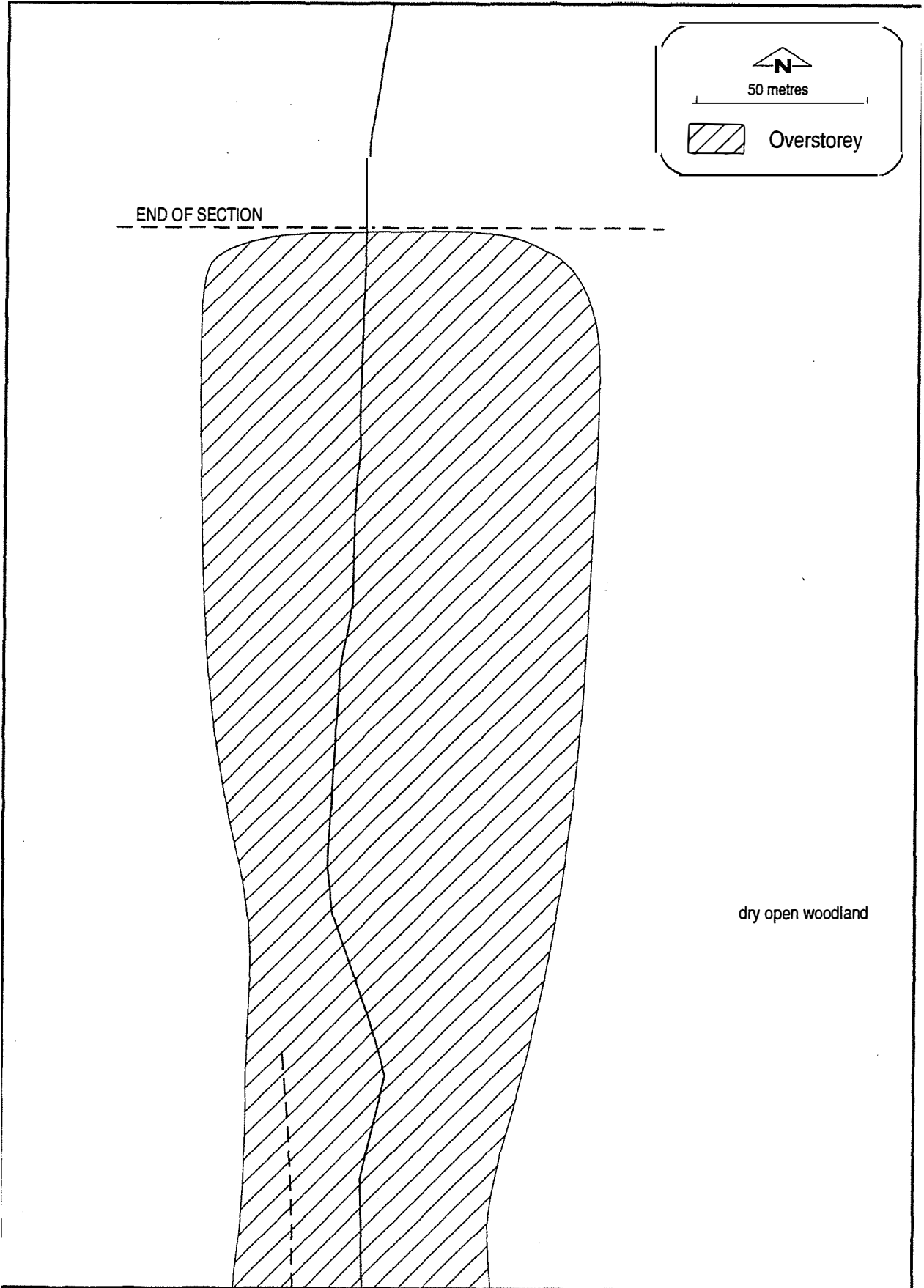
Fred Jacoby Reserve, Bending Gully Creek Site 1B: Map 1





Fred Jacoby Reserve, Bending Gully Creek Site 1B: Map 2





Fred Jacoby Reserve, Bending Gully Creek Site 1B: Map 3





4.3 Nelson Road

Department of Conservation and Land Management Reserve

Results

Foreshore Condition Survey

A Study undertaken on behalf of
Water and Rivers Commission and the Natural Heritage Trust



Helena – Site 2: Maps 1-4 Nelson Road CALM Reserve

Length of section (m): 1700 m
 Recorder's name: B Waining
 Date surveyed: 25/6/99
 Nearest road access: Nelson Road
 Lot number(s): CALM bushland reserve, 196 and 197

Summary of river health:

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Yellow	Yellow	Green	Green
Moderate	Moderate	Good	Good
4	4	6	6

Stream Condition
Yellow
Moderate
20

Description

Bank stability: This section of creek extends north from its confluence with the Helena River. Throughout the majority of the survey section the creek flows through steep sided rocky gullies with grades to 90°. At the northern end of the section the banks flatten to <30° and the channel opens out to approximately 2 m in width, allowing for a less constrained flow of water. There is some localised erosion, most noticeably on the outside of bends in the creek where it is associated with localised scouring/slumping events. There are also some areas of sedimentation, especially in the wider zones at the northern end of the section, where the creek flow rates are slowest. It is likely that these sediment plumes originated from material washing downstream from an access track that crosses the creek, towards the northern end of the section where a simple culvert passes under the track. A vineyard property, situated further upstream beyond the extent of this survey, may also be contributing to sedimentation due to surface runoff following site disturbance.

Recommended Strategies

- Liaise with Main Roads WA, the Department of Conservation and Land Management and local government authority to investigate best management practice pipe drainage designs, and install to stabilise the cross-over.
- Encourage the Department of Conservation and Land Management and/or the local government authority to construct formal drainage structures alongside the access track, to reduce sediment entering the stream from this source.
- Provide vineyard owners and managers with information leaflets about how they can help minimise their impact on bushland and waterways.
- Liaise with the Department of Environmental Protection to monitor vineyard activities, to ensure they have no adverse impacts on the waterway.
- Monitor the level of natural regeneration, if necessary propagate plants at the Wooroloo Prison Farm from seed collected in the area and undertake reinforcement plantings and direct seeding.



Vegetation: This site is characterised by the dominance of an open sclerophyll woodland community. The major components of this type of vegetation structure have a characteristic patchy overstorey, 20-80% cover, with frequent occurrences of *Corymbia calophylla* (Marri), occasional *Eucalyptus marginata* (Jarrah) and *E. laeliae* (Darling Range Ghost Gum). *Melaleuca raphiophylla* (Swamp Paperbark) also occurs infrequently within the overstorey. There are no exotic overstorey species present. The middlestorey is continuous with an abundance of *Grevillea endlicheriana* (Spindly Grevillea) and *Trymalium ledifolium*. Other frequent species include *Agonis linearifolia* (Swamp Peppermint), *Calothamnus quadrifidus* (One Sided Bottlebrush), *Hakea cristata* (Snail Hakea) and *Xanthorrhoea preissii* (Grass Tree) contributes to the middlestorey. The middlestorey also comprises occasional occurrences of species including *Acacia alata* (Winged Wattle), *A. pulchella* (Prickly Moses), *A. saligna* (Coojong), *Lepidosperma tetraquetrum* (Angle Sword Sedge) and *Viminaria juncea* (Swishbush). A single weed species was present within the middlestorey, the introduced Bulrush (*Typha orientalis*). The understorey was also along the survey site. Common species identified include frequent *Astroloma pallidum* (Kick Bush), *Borya sphaerocephala* (predominantly on shallow soils of granite outcrops), *Cheilanthes* sp. and *Darwinia citriodora* (Lemon Scented Darwinia). The diverse understorey also includes *Dryandra nivea* (Couch Honeypot), *Alexgeorgea arenicola*, *Baeckea camphorosmae* (Camphor Myrtle), *Hakea lissocarpa*, *Hibbertia spicata* (Yellow Buttercups), *Hypocalymma angustifolium* (White Myrtle) and *Macrozamia reidleyi* (Zamia). Occasional *Andersonia lehmanniana*, *Calothamnus sanguineus* (Pindak), *Corynotheca micrantha*, *Grevillea bipinnatifida* (Native Fuchsia) and at least four species of rushes, sedges and grasses, including *Juncus pauciflorus* (Loose Flowered Rush) and *Microlaena stipoides* (Weeping Meadow Grass) were also recorded. *Watsonia* (*Watsonia bulbifera*) is present at both ends of this section and is particularly dominant at the southern end while the population at the northern end is an isolated stand. This raises concerns about the risk of on-going invasion up the creekline.

- Focus weed control works on managing the spread of the *Watsonia* infestation at the southern end of the section, and work to eradicate it.
- Remove the isolated occurrence of *Watsonia* at the northern extent of the section, and monitor and treat any regrowth regularly.
- Ensure that no destabilisation occurs during weed removal activities; use temporary soft engineering techniques as applicable (Appendix 4).
- Revegetate the area of weed removal, using appropriate native species (Appendix 3).
- Remove and control the re-emergence of the introduced Bulrush *Typha orientalis*, using the suggested methodology (Appendix 2).



Stream Cover: The surrounding native vegetation of this stream section affords an abundance of stream cover. Within the channel itself, a number of rushes, sedges and native grasses provide significant areas of permanent cover to the stream. The steep rocky banks provide protection to the stream and a good substrate supporting a diverse range of fringing vegetation, such as *Borya* sp. No deciduous trees were observed. The stream contains an abundance of instream cover including rocks, leaf litter, branches and vegetation.

Habitat diversity: The nature of the diverse open woodland vegetation, and the surrounding landforms, creates diverse habitats that can support a wide range of terrestrial and aquatic organisms. The water within the creek varies in depth, from <5 cm at the northern end of the section, to approximately 15-20 cm at the southern end. The quality of the water appears to be good, with no signs of turbidity or algal blooms. Wildlife (or signs of) observed during the survey included kangaroos, bandicoots, frogs, and various species of birds.

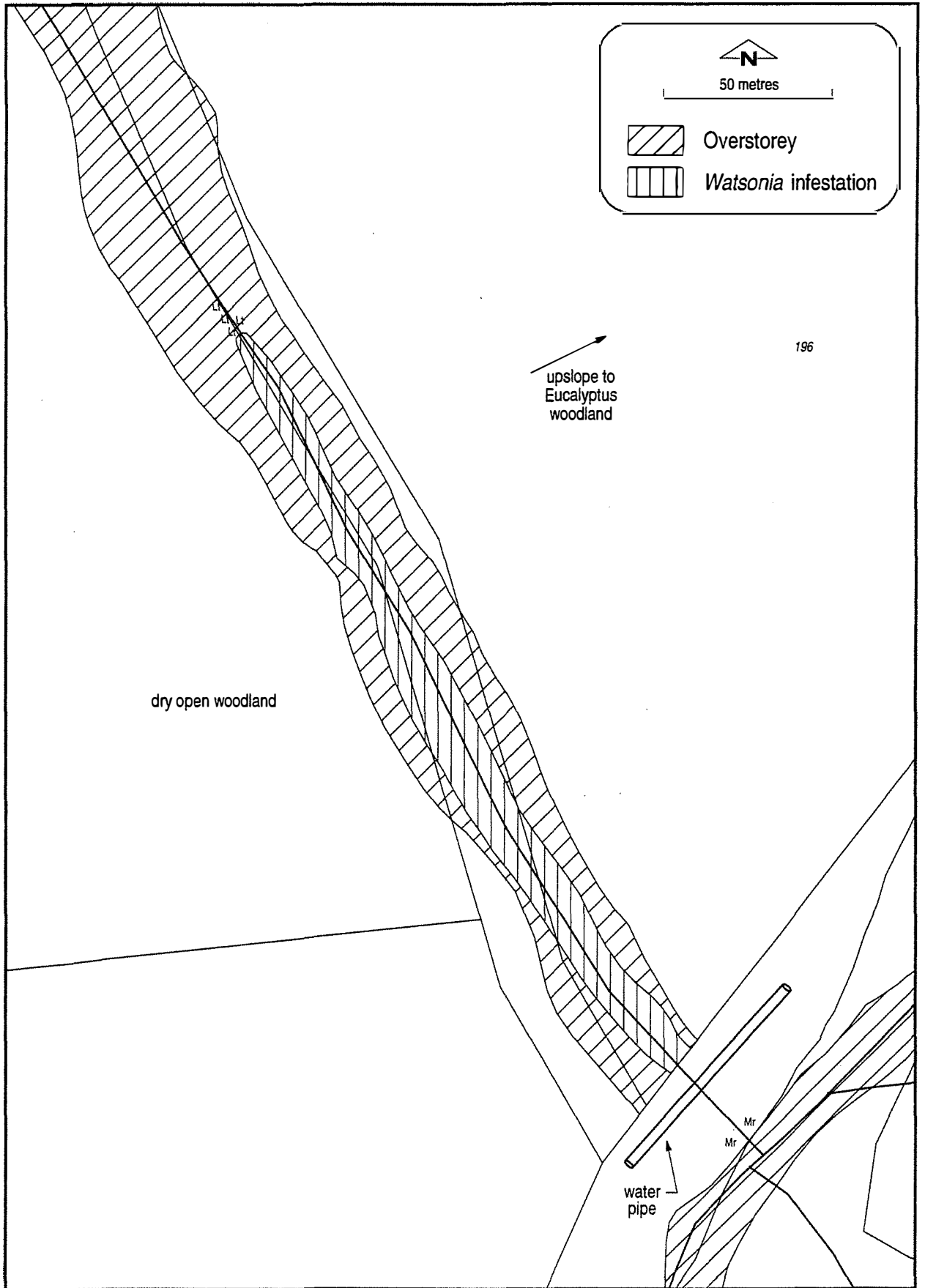
Other issues: The access track crossing the creek has not been constructed with bank stability in mind, as there is localised degradation of the banks at this location. Access to the area, in case of fire, could be severely hindered as a result of the placement of a locked gate and high fence across the constructed access trail. The vineyard, at the headwaters of the stream catchment, may be a source of chemical residues entering the waterways.

- Minimise the spread of *Watsonia*, to ensure the integrity of the stream cover provided by native vegetation.
- Ensure that weed control activities are undertaken in a manner which ensures that continuous cover and habitat is provided at all stages of works (Appendix 2).
- Maintain the natural state of the creekline.
- Liaise with the local government authority, the Ministry for Planning, the Department of Environmental Protection and Main Roads WA to monitor activities within the catchment to ensure that any infrastructure maintenance or management works are not contributing, or will not contribute to the degradation of this waterway.

- Maintain the natural state of the streamsides and surrounding woodlands, to preserve the diverse habitats offered by this area.
- Liaise with the Water and Rivers Commission and the Department of Environmental Protection to encourage the monitoring of external influences on the stream health, such as potential for chemical residue/runoff from the vineyard.
- Provide an information pack to the owners of the vineyard including information about the importance of protecting creeklines, and how they can help the waterway through effective property management, and possibly provide them with relevant AgNotes.

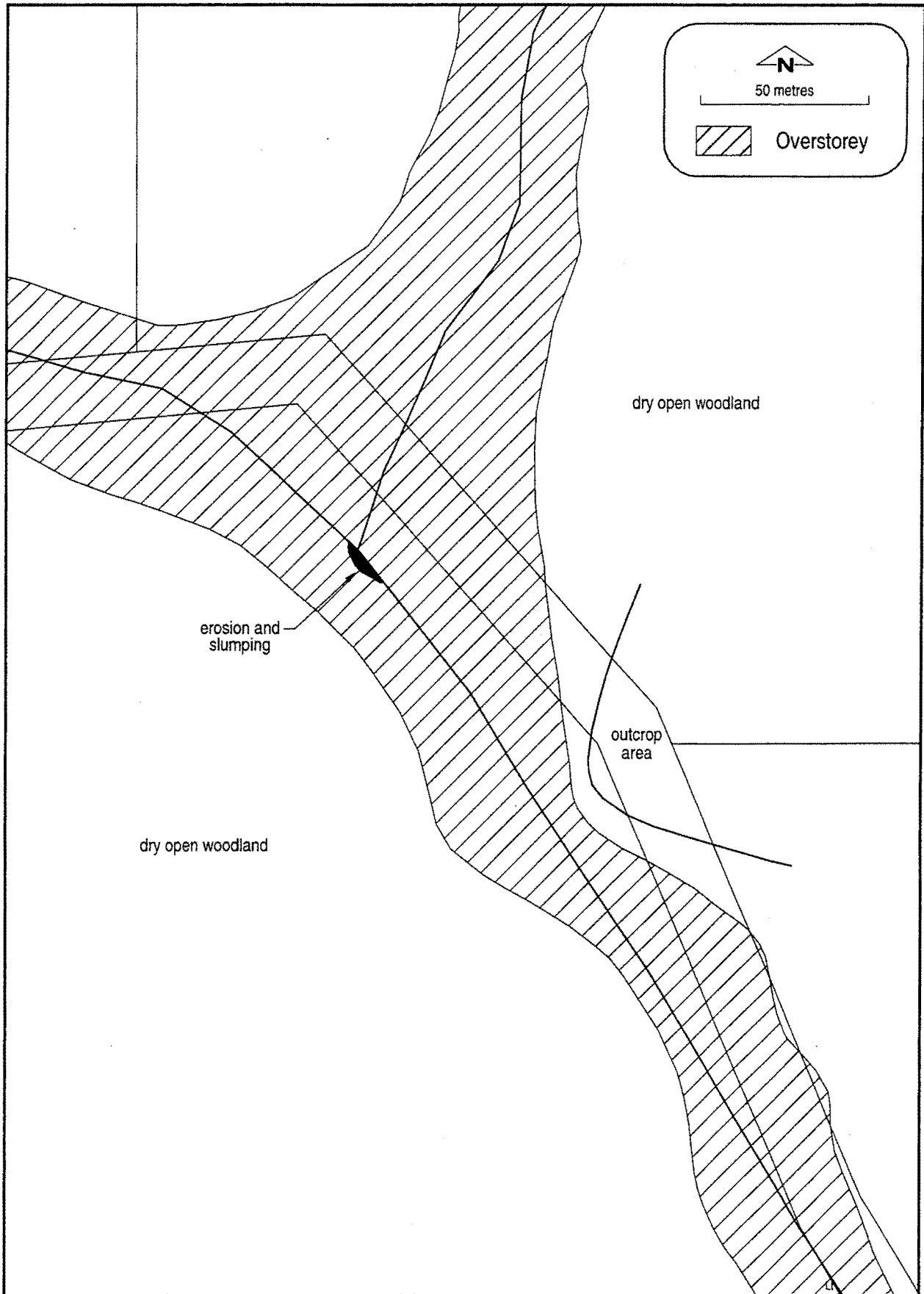
- Liaise with the local government authority and the Water and Rivers Commission to re-construct the creek crossing, using appropriate designs to maintain hydrological balance.
- Negotiate to relocate the vineyard southern boundary fence where it impedes access along the track. Alternatively the track could be placed in a different position; however, the track is located on the northern bank of a small tributary and relocation may create some problems with increased sediment load entering the stream.





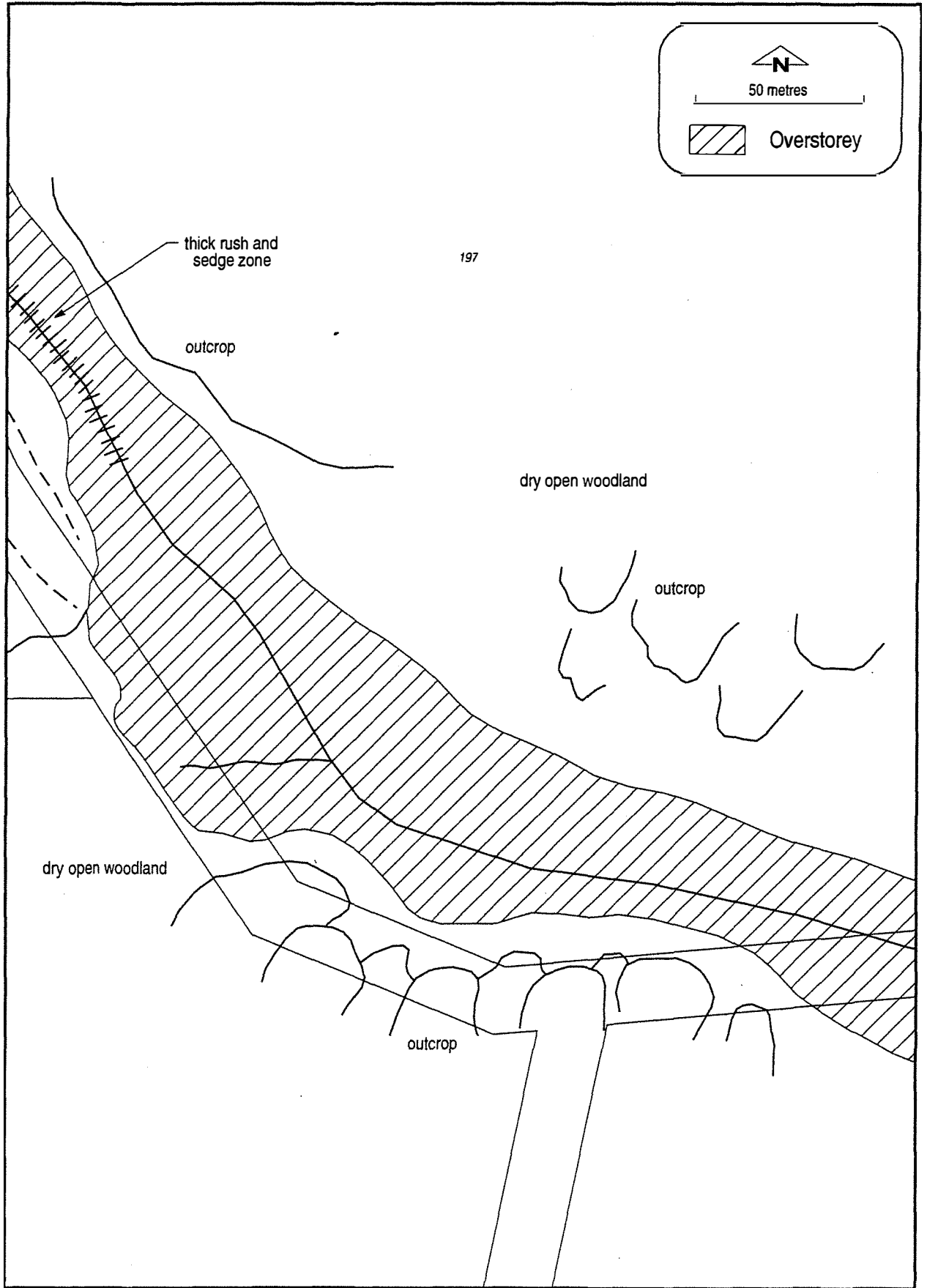
Nelson Road, CALM Reserve Site 2: Map 1





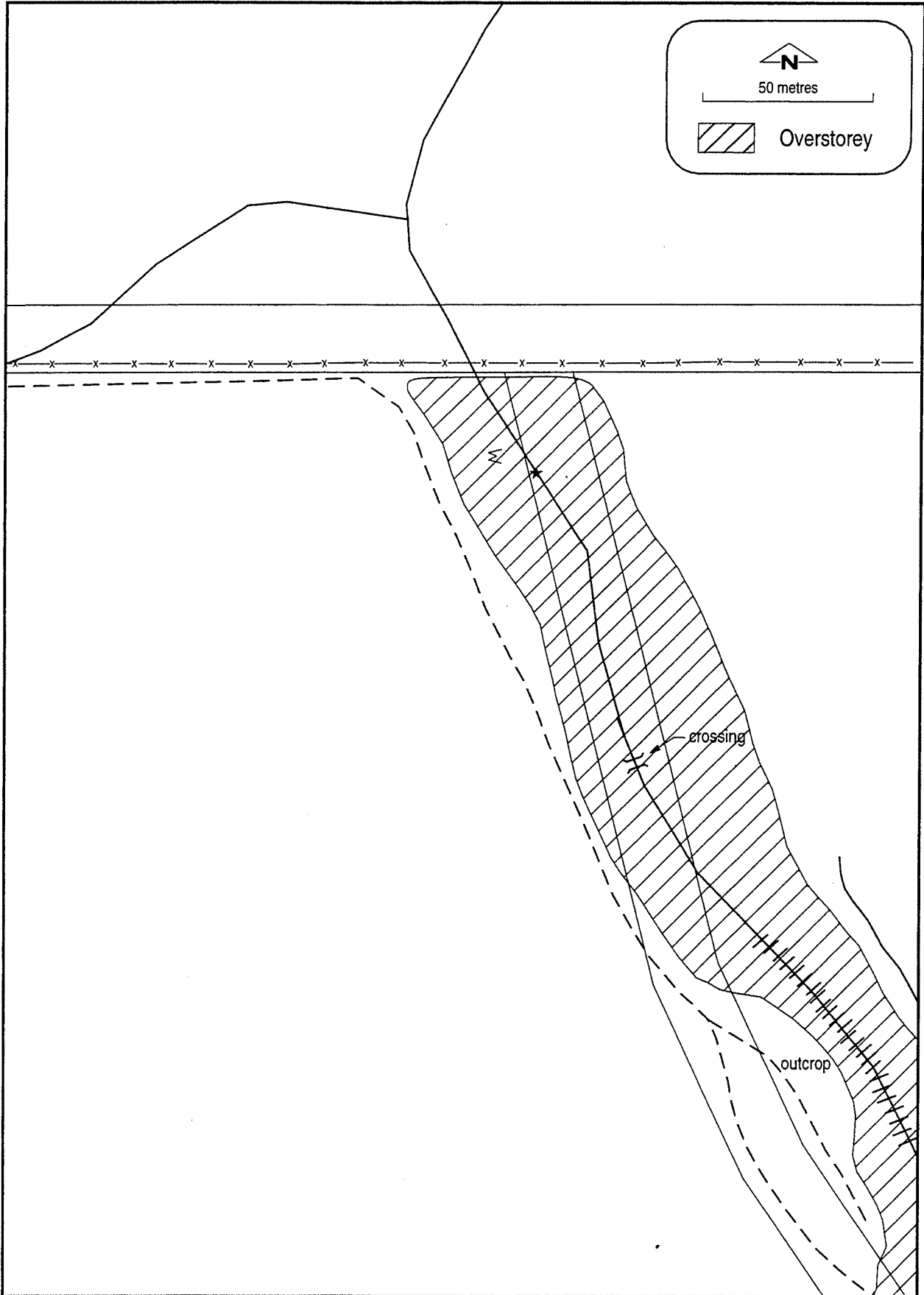
Nelson Road, CALM Reserve Site 2: Map 2





Nelson Road, CALM Reserve Site 2: Map 3





Nelson Road, CALM Reserve Site 2: Map 4



4.4 Nyaania Creek

Results Foreshore Condition Survey

A Study undertaken on behalf of
Water and Rivers Commission and the Natural Heritage Trust



Helena – Site 3: Map 1-3 (Section A) Nyaania Creek

Length of section (m): 980 m
 Recorder's name: B Wainig
 Date surveyed: 2/7/99
 Nearest road access: Victor Road
 Lot number(s): Victor Road Reserve, 23

Summary of river health:

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Red	Yellow	Red	Yellow
Poor	Moderate	Poor	Moderate
2	4	2	4

Stream Condition
Red
Poor
12

Description

Bank stability: This survey site is located at the southern end of Nyaania Creek near Victor Road. The main channel is up to 2 m wide and is characterised by extensive, steep rocky banks between 45-60°. There are some minor islands within the centre of the channel. Erosion is evident along 50% of the foreshore and localised slumping occurs, especially on the creek bends. There are areas of the main channel which have been scoured to bedrock, contributing to the sediment load of the creek resulting in localised sedimentation. There has been a recent fire event, which may have contributed to bank destabilisation, and an increased sediment load to the creek through the loss of fringing vegetation. Dry rock walls have been constructed at the culvert crossing Victor Road, in an attempt to minimise bank disturbance.

Vegetation: The vegetation of this section is characteristic of a dry open woodland. Plant deaths are attributable to a recent fire, however good levels of regeneration were observed during the survey. The overstorey is patchy consisting of frequent *Corymbia calophylla* (Marri) and occasional *Melaleuca raphiophylla* (Swamp Paperbark). There is also an

Recommended Strategies

- Undertake weed suppression and removal activities, ensuring no further bank destabilisation occurs.
- Revegetate the creek sides, with appropriate, locally derived native species.
- Employ some soft engineering solutions, as required, to aid in bank stabilisation during revegetation works (Appendix 4).
- Liaise with the Water and Rivers Commission to undertake stream hydrology assessment, determining appropriate structures required within the channel to aid in the rebuilding of the channel base.
- Assess landuse practices and instream processes on a whole of catchment approach to identify the major sources of sediment to the creek and to develop strategies to address the sediment and water load entering the waterway.
- Undertake weed control activities, ensuring that the importance of maintaining bank stability is a primary consideration.
- Revegetate the banks of the creek, using seedlings and direct seeding methods to take advantage of the ash bed.



isolated occurrence of *Nuytsia floribunda* (Christmas Tree). The middlestorey is also patchy in nature, in keeping with the structure of the open woodland although the extent and cover of this stratum may still reflect the impact of the recent fire. Species occurring in the middlestorey include frequent *Acacia pulchella* (Prickly Moses), *Hakea cristata* (Snail Hakea), *Xanthorrhoea preissii* (Grass Tree), *Calothamnus quadrifidus* (One Sided Bottlebrush) and *Labichea lanceolata* (Tall Labichea). There are also occasional occurrences of *Acacia alata* (Winged Wattle), *Grevillea endlicheriana* (Spindly Grevillea), *Hakea lissocarpa* (Honeybush) and *Viminaria juncea* (Swishbush). The understorey displays the signs of disturbance, through the impact of fire, and is more sparse than expected in this type of vegetation community. The more common species in the understorey include *Hibbertia spicata* (Yellow Buttercups), *Macrozamia reidleyi* (Zamia), *Dryandra nivea* (Couch Honeypot), *Darwinia citriodora* (Lemon Scented Darwinia), *Alexgeorgea arenicola*, *Borya sphaerocephala*, *Corynotheca micrantha* and the creeper *Convolvulus erubescens*. There are also infrequent to occasional occurrences of at least three species of rushes and sedges. Weeds occur throughout the section and include occurrences of the highly invasive *Watsonia* (*Watsonia bulbifera*), *Gladiolus* (*Gladiolus* sp.), Bridal Creeper (*Asparagus asparagoides*) and Deadly Nightshade (*Solanum nigrum*). Other weed species present include Dock (*Rumex* spp.), Soursob (*Oxalis pes-caprae*), Fleabane (*Conyza* spp.), Guildford Grass (*Romulea rosea*) and assorted annual grasses. Further upstream there is an increase in the invasion of pasture grass species, as the rural land usage and the recreation reserve converge (see Section B).

- Encourage the local government authority to define pathways using guideways and bollards for pedestrian access, to avoid excessive widespread trampling and spread of weed seeds.
- Conduct field days with a botanist in attendance to ensure weed species can be recognised by those involved in the rehabilitation efforts.
- Focus weed control on species which are relatively easy to remove by hand including Deadly Nightshade, Fleabane and Dock prior to flowering and seeding – ensuring that weeders wear gloves when handling Deadly Nightshade.
- Develop an intensive weed management program for the control of the highly invasive species including Bridal Creeper, *Watsonia* and *Gladiolus* using qualified weed control operators.
- Focus attention on hand weeding around any persistent native plants to establish a buffer between these remnants and the weed populations.
- Prioritise control on maintaining the buffer.



Stream cover: The nature of the open woodland vegetation results in occasional to frequent areas of stream cover. Some mid-channel islands, containing vegetation, provide good levels of stream cover in their immediate vicinity. The instream cover is maintained by the presence of leaf litter, branches, rocks and some vegetation. There are some sections of the creek where the flow passes over rocky outcrops that contain little or no fringing vegetation, but offer some instream cover in the form of rocks and branches.

Habitat diversity: It is uncertain if there is any permanent water in this section. Some water may remain in pools where the creek flows over rocky outcrops. The water depth is relatively constant throughout the section (approximately 15 cm), however it is deeper within the pools. There was a high degree of turbidity at the time of this survey, which was immediately after a rainfall event. The rocky outcrops and neighbouring vegetation provide extensive areas of habitat. The vegetation distant from the rocky outcrops is somewhat lacking in good habitat value, due to the open nature of the regenerating vegetation. The lack of dense streamside vegetation along much of the section may detract from the value of the habitat available to frogs. The diversity of the instream environment, with pools, cascades, riffles and pools, provides a variety of habitats for aquatic organisms.

Other issues: There is some rubbish within the creek, which appears to come from upstream during peak flow events. The rubbish may enter the creekline from the stormwater system of the residential zones upstream. A road reserve occurs within this section of the creek.

- Re-establish streamside vegetation, using native rushes and sedges.
- Implement assisted regeneration to increase the density of riparian vegetation complexes focusing on the over and middlestoreys (Appendix 3).
- Protect instream debris such as branches where these features do not exacerbate erosion.
- Monitor the sediment load and characteristics of the sediment entering the waterway to ensure that it is not creating a significant hydrological disturbance.

- Control the invasion of weed, so as to promote native vegetation regeneration to provide additional habitat in the area.
- Retain all fallen timber/branches.
- Work to establish management strategies to protect this area from any further disturbance.

- Work with Main Roads WA and the local government authority to install gross pollutant traps on stormwater system outfalls into the creekline to collect most of the rubbish and sediment.
- Approach the local government authority to establish some recreational facilities such as toilets, tables and rubbish bins. Such facilities should be located close to the Victor Road car park. Encouraging use of the area may help to promote more responsible management of the reserve.
- Contact the Department of Conservation and Land Management, Main Roads WA and the Department of Environmental Protection to determine the status of the road reserve, which crosses this section. Investigate the feasibility of changing the vesting and purpose to reflect recreation and conservation values.



Helena – Site 3: Maps 3-4 (Section B) Nyaania Creek

Length of section (m): 740 m
Recorder's name: B Waining
Date surveyed: 5/7/99
Nearest road access: Glen Road
Lot number(s): 5, 35, 1, 300, 20, 11, 10 and 9

Summary of river health:

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity	Stream Condition
Red	Black	Red	Black	Black
Poor	Very Poor	Poor	Very Poor	Very Poor
2	0	2	0	4

Description

Bank stability: This section of the creek passes through a semi-rural/residential area. The channel is more incised than further downstream (refer to description in Section A). The foreshore banks in this area display significant levels of degradation with extensive areas of erosion and slumping occurring. The channel is up to 1.5 m in depth and width. On the northern side of Glen Road, the creek is divided into two channels. Runoff from a number of residential properties directly enters the waterway. There are localised occurrences of sedimentation. An instream crossing point occurs at the northern end of the section. Horses have uninhibited access to the creek. Water also enters the creek from a seep, which drains across a paddock on the left-hand side. There is no defined drainage line for this water.

Recommended Strategies

- Revegetate fringing vegetation, replacing the existing pasture grass species.
- Encourage the local government authority to construct an elevated or reinforced crossing point, for stock and vehicles, where the existing instream crossing point exists.
- Approach the landholder(s) to establish offline stock watering points.
- Encourage the landholder(s) to fence 10 m from high water mark along the creekline, to prevent stock access to the stream banks and to protect remnant vegetation and encourage natural regeneration.
- Liaise with the Water and Rivers Commission to determine the feasibility of assessing sediment and water load arising from upstream; and investigate the need for construction of pool and riffle sequences to enable the stream to rebuild its bed.
- Fence off the seep and possibly use the area for summer grazing using perennial grasses as a compromise for fencing off the main creekline (if the landholders are unwilling to revegetate it with native species). Liaise with AGWEST to determine appropriate perennial species and ensure that the management of such a cropping system prevents the plants from seeding, and that plant fragments are trapped to prevent these species from invading the riparian foreshore.



Vegetation: The vegetation within this section of the creek is confined to a narrow fringe of remnant native and introduced plant species. The overstorey component of this section comprises frequent to occasional occurrences of *Corymbia calophylla* (Marri), *Eucalyptus rudis* (Flooded Gum) and *Melaleuca raphiophylla* (Swamp Paperbark). There are at least three weed tree species within the overstorey, including two Weed Wattles and the Edible Fig Tree (*Ficus carica*). The native middlestorey is poorly represented within this section, comprising only sparse cover. Native species present include infrequent to occasional occurrences of *Allocasuarina humilis* (Dwarf Sheoak), *Acacia alata* (Winged Wattle), *A. pulchella* (Prickly Moses), *Hakea cristata* (Snail Hakea), *Trymalium ledifolium*, *Xanthorrhoea preissii* (Grass Tree) and *Labichea lanceolata* (Tall Labichea). The majority of the middlestorey weed assemblage comprises occurrences of the Giant Reed (*Arundo donax*) and infrequent occurrences of Cactus. The understorey is continuous, however it retains very few native understorey species, and is dominated by annual grasses and pasture species. Persistent native understorey species within this section include occasional to rare occurrences of *Hibbertia spicata* (Yellow Buttercups), *Macrozamia reidleyi* (Zamia), *Cheilanthes* sp., *Drosera microphylla*, *Kennedia prostrata* (Running Postman) and rare occurrences of rushes and sedges. Weeds present within this section, in addition to the grasses, include *Watsonia bulbifera*, Soursob (*Oxalis pes-caprae*), Fleabane (*Conyza* spp.), Bridal Creeper (*Asparagus asparagoides*), Kikuyu (*Pennisetum clandestinum*) and Guildford Grass (*Romulea rosea*).

Stream cover: There is frequent stream cover provided by the fringing native vegetation within this section of the creek. Occasional exotic vegetation also provides cover to the creek. There are deciduous trees present along the fringes of this section of the creek, which may result in seasonal loss of cover. Instream cover includes rocks and leaf litter, with occasional branches. The stands of Giant Reed offer substantial instream cover.

- Liaise with the landholders to encourage them to become involved in active management of their streamline.
- Provide the landholders with information about how to manage highly invasive species such as Giant Reed, *Watsonia* and Bridal Creeper, advising them of the impact that these species can have on remaining flora and the impact on property values when these species become dominant.
- Remove weed species, ensuring that the banks are not destabilised.
- Encourage fencing off of the creekline, with weed control effort assigned to the fenced area.
- Re-establish the range of over, middle and understorey vegetation within the fenced zone using appropriate native species (Appendix 3).
- Encourage planting of large native tree stock in the paddock to provide shade for the livestock – ensuring that fences are erected at least 5 m from the tree to protect them from grazing.
- Establish rushes and sedges along the wet areas from the seep in the paddock.
- Fence off revegetation from grazing animals.
- Ensure exotic garden plants do not invade the creekline.

- Re-establish the fringing native vegetation complex.
- Remove weed species.
- Retain instream cover features, such as logs, branches and rocks, where they are not exacerbating erosion.
- Ensure that at least 60% stream cover is available at all times when implementing weed control works.



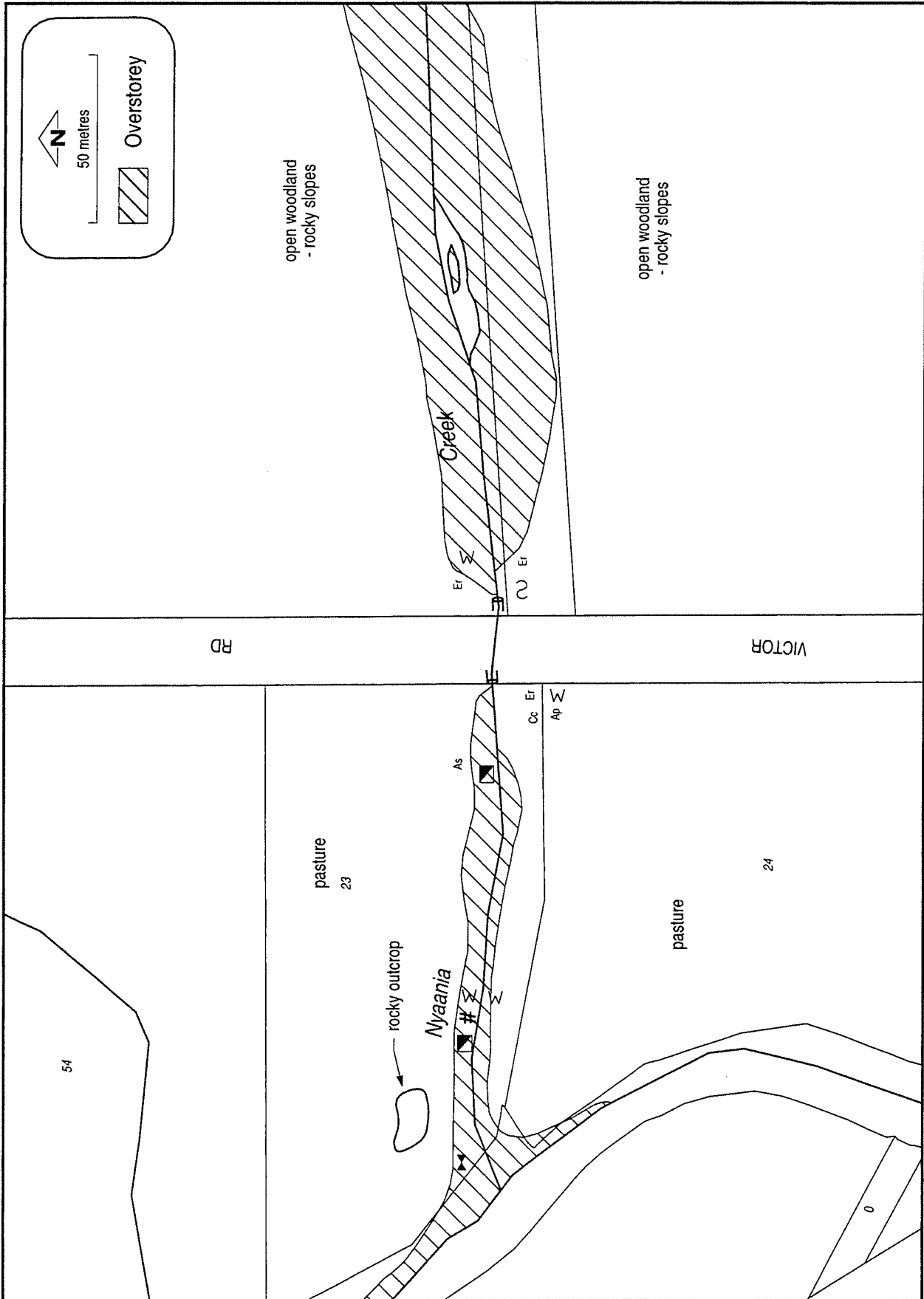
Habitat diversity: The habitat value in this section of the stream is limited due to the low vegetation diversity and the narrow nature of the riparian fringe. There is an area of instream rocks, and adjacent rocky outcrops, which provides some level of habitat value to both terrestrial and aquatic organisms.

Other issues: There is a small weir at the front of the most northern house, south of Glen Road. The purpose of this is unknown, but it may serve to retain sufficient water levels to enable water to be drawn from this point. There is also rubbish along this section of the creek, which most probably comes from the nearby road verges and stormwater drains. There is a small orchard on the left hand side of the creek, which may contribute to nutrient and chemical discharge to the creek. There are car bodies within 20 m of the creek line, which need to be removed. The existence of stock and a crossing point within the creek is a concern as they would contribute to bank destabilisation, faecal coliforms, nutrients and weed seed in the waterway. The extent of exotic garden species and refuse may be a source for future weed invasions along the creek.

- Retain logs, branches and rocks within the creek.
- Revegetate the foreshore using species suggested in Appendix 3 to create a wider fringe.
- Remove weed species and replace with natives, to improve the available habitat.
- Fence to exclude stock.

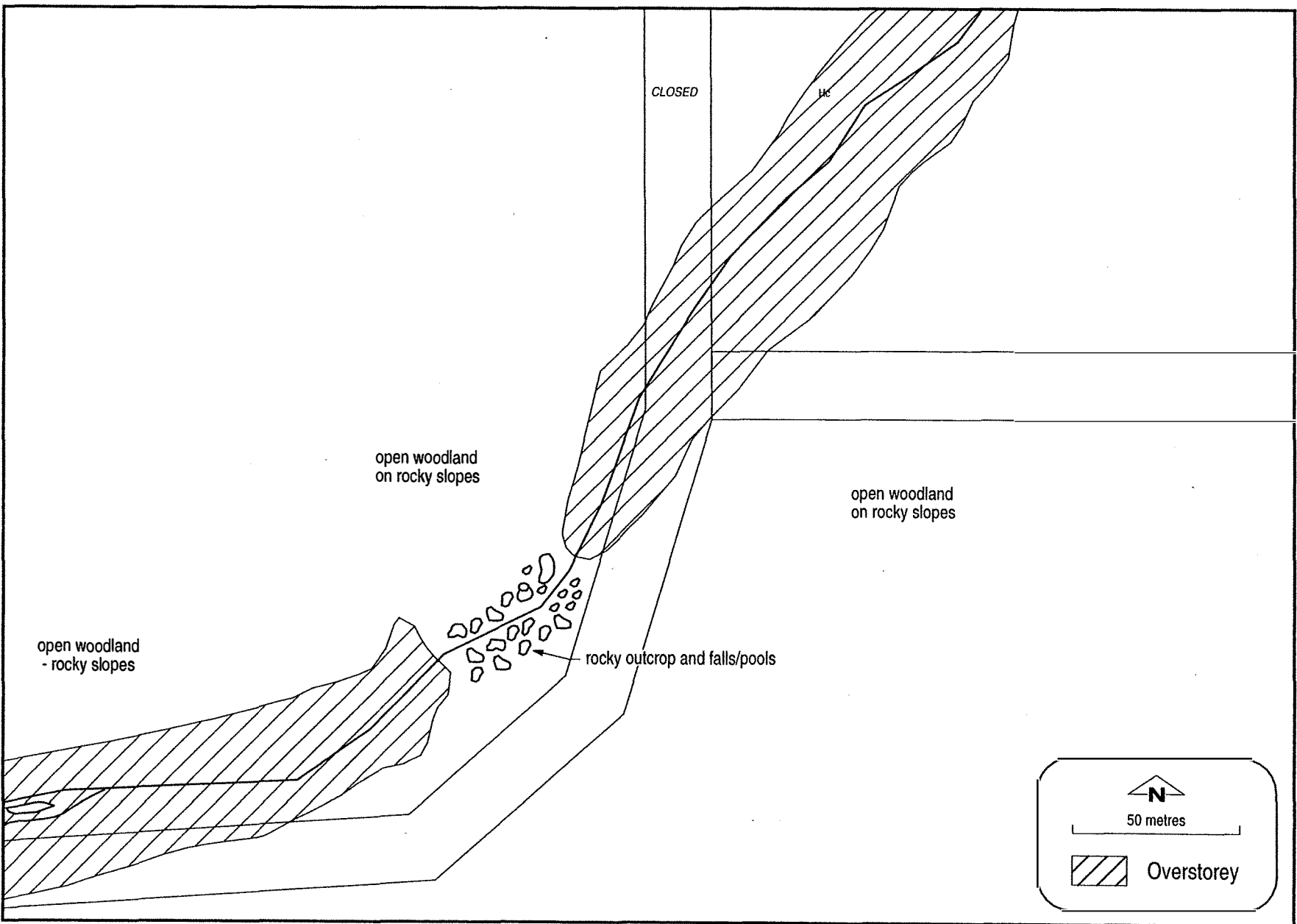
- Liaise with the landholder to determine the weir function, and encourage them to restore stream flow if they are amenable.
- Contact Main Roads WA and the local authority to identify the source of the rubbish and, if it enters through the stormwater system, develop a stormwater strategy that includes gross pollutant traps.
- Remove old car bodies.
- Liaise with the orchardist about the previous/past and current use of chemicals and/or fertiliser on the orchard and pastures.
- Approach the Water and Rivers Commission to determine the possibility of designing and implementing a water quality monitoring program in conjunction with the Ribbons of Blue program, involving local residents whenever possible.
- Inform residents about the nature of garden exotics, and their impact on creeklines when they invade native vegetation.
- Encourage residents to monitor their garden plants, dispose of waste appropriately and control any garden escapes.





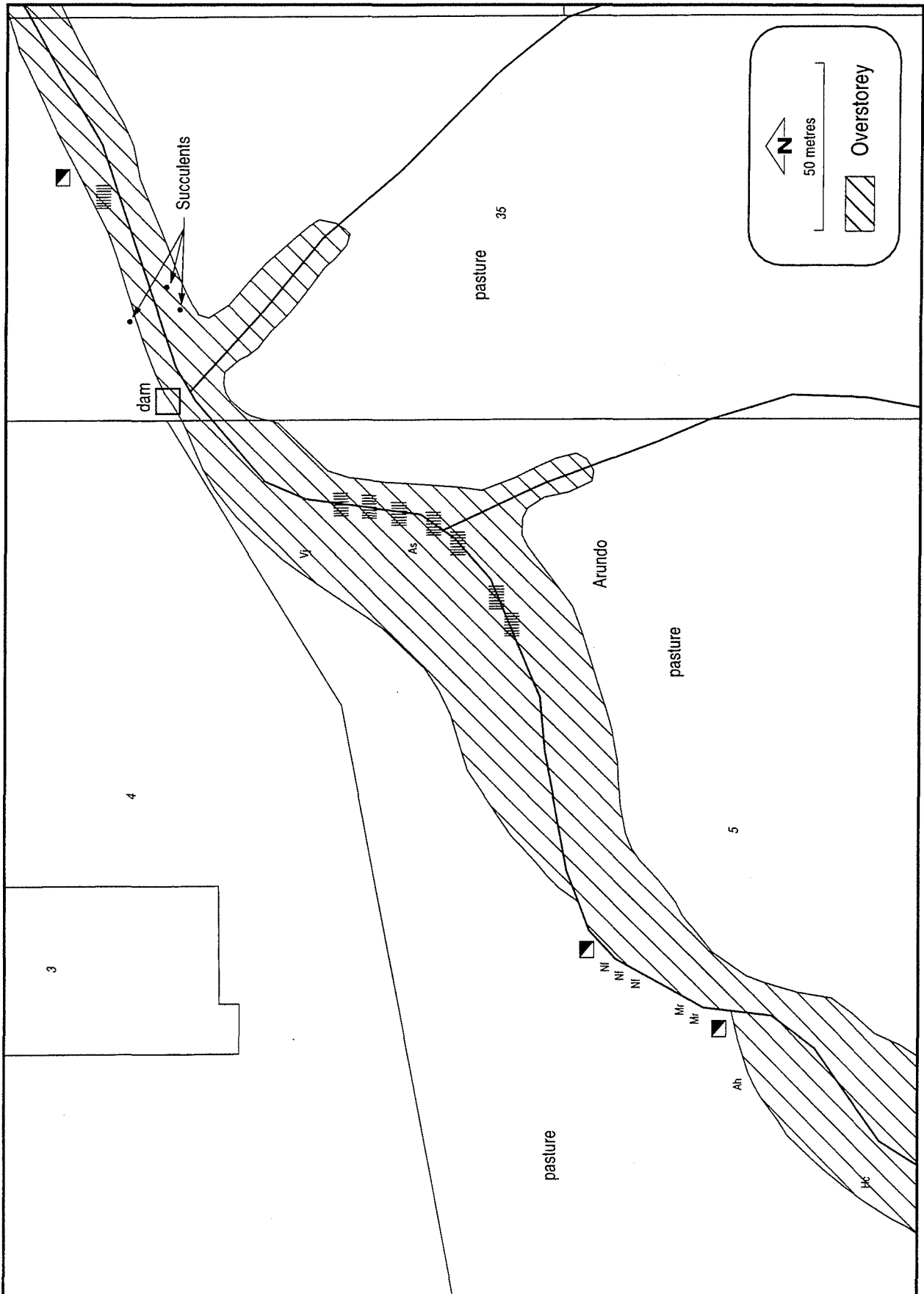
Nyaania Creek Site 3: Map 1 (Section A)





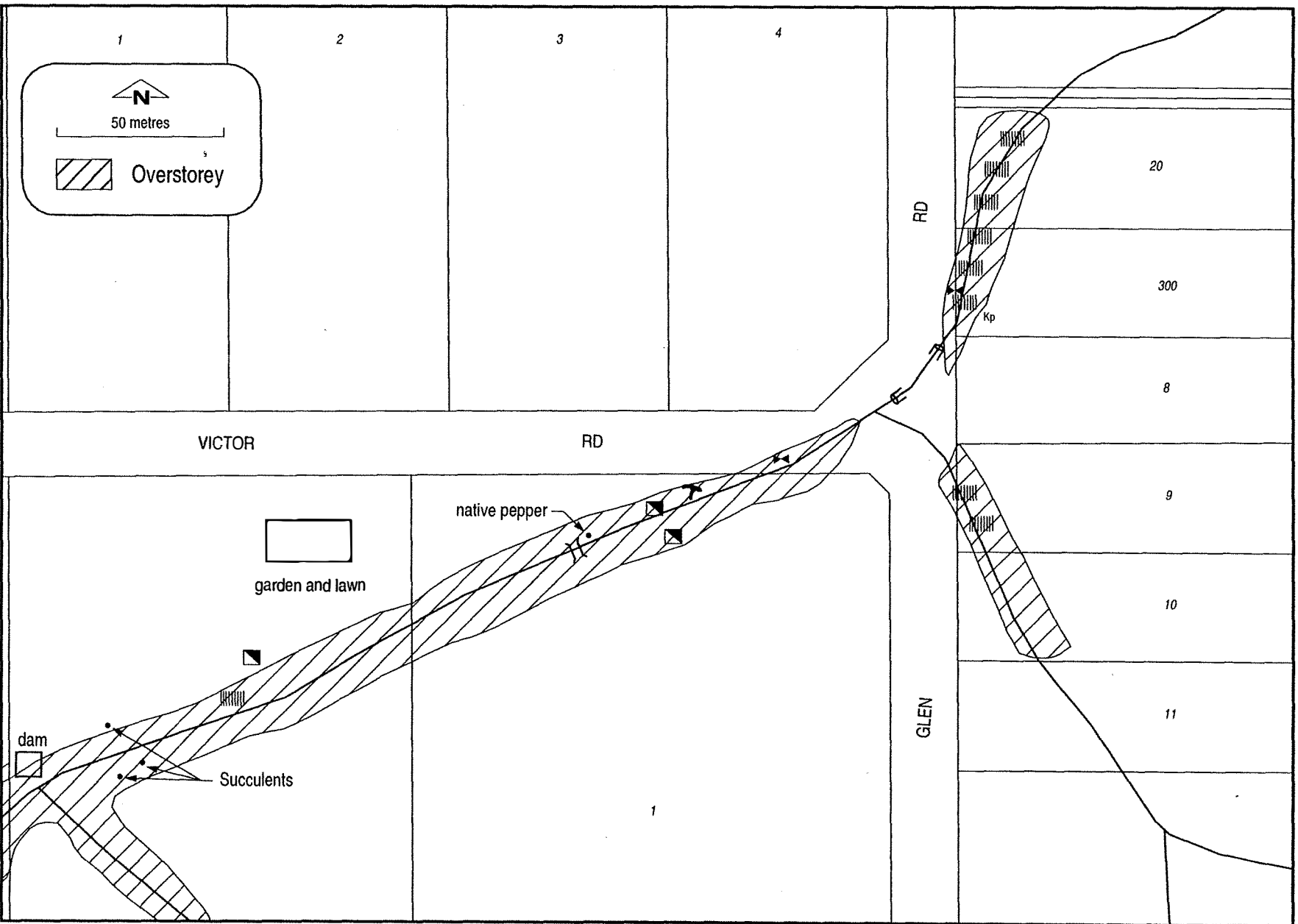
Nyaania Creek Site 3: Map 2 (Section A)





Nyaania Creek Site 3: Map 3 (Section A & B)





Nyamania Creek Site 3: Map 4 (Section B)





4.5 Kidman Avenue

Helena River

Results

Foreshore Condition Survey

A Study undertaken on behalf of
Water and Rivers Commission and the Natural Heritage Trust



Helena – Site 4: Maps 1-12 Kidman Ave - Helena River

Length of section (m): 5500 m
Recorder's name: B Waining
Date surveyed: 17/6/99
Nearest road access: Kidman Avenue (West end) Stirling Crescent (East end)
Lot number(s): 17,18, 1, 2, 3, 8, 7988, 3, 22, 50, 18, 71, 70, 51, 1499, 100, 500, 501, 3, 19, 6, 7, 8, 9, 1, 2 and 12

Summary of river health:

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Red	Red	Yellow	Yellow
Poor	Poor	Moderate	Moderate
2	2	4	4

Stream Condition
Red
Poor
12

Description

Bank stability: This section of the Helena River extends upstream from its confluence with the Swan River. Along the lower sections the river channel widens to 10 m and the banks are of moderate slope (10-45°). Further upstream the river narrows to approximately 2 m, with variations in the bank height and slope, up to 6 m and 60° respectively. The quantity of water within the channel also decreases with increasing distance from the confluence with the Swan River. There is widespread evidence of erosion along the river banks, with up to 50% of the section affected. Localised severe erosion is also visible in some locations, particularly where drainage outfalls connect with the river. Slumping and sedimentation are also evident. Much of the bank de-stabilisation can be attributed to the loss of fringing vegetation, weed invasion and widespread uncontrolled stock access to the foreshore of the river.

Recommended Strategies

- Control weed invasion along the fringes of the river ensuring that weed management works do not exacerbate erosion.
- Revegetate the river banks with suitable native species (see list suggested in Appendix 3).
- Encourage landholder(s) to construct fences, where they do not currently exist, along the foreshore to protect the revegetation efforts and riparian vegetation from livestock.
- Remove weed trees and other weed species ensuring their extensive root systems remain intact (Appendix 2), following establishment of native vegetation to prevent further bank destabilisation.
- Monitor for suckers and seedlings appearing adjacent to poisoned trees and treat in accordance with Appendix 2.
- Liaise with the local government authority to modify drainage outfalls by opening the pipe and installing rocky spillways that are vegetated on each side to achieve erosion control where the flow enters the river (Appendix 4).
- Install offline watering points for stock.



Vegetation: The overstorey vegetation forms a narrow fringe along the waterway. The cover is rated as patchy, with 20-80% proportionate cover that is continuous at the western end of the section, becoming increasingly patchy towards the east. The overstorey comprises up to 80% native species including abundant *Eucalyptus rudis* (Flooded Gum), frequent *Melaleuca raphiophylla* (Swamp Paperbark) and occasional *Eucalyptus wandoo* (Wandoo). Infrequent exotic species are present including Olives (*Olea europaea*), Edible Fig (*Ficus carica*) and Japanese Pepper (*Schinus terebinthifolia*). The native component within the middlestorey is very sparse. Occasional *Acacia saligna* (Coojong) are the only significant native species seen along the section. The middlestorey contains numerous weed species including Cotton Bush (*Gomphocarpus fruticosus*), Castor Oil (*Ricinus communis*), Bulrush (*Typha orientalis*) and the Giant Reed (*Arundo donax*). The understorey of this section is continuous, but comprises at least 90% weed species. These weed species include a range of pasture and annual grasses, *Watsonia* (*Watsonia bulbifera*), Blackberry (*Rubus fruticosus*), Arum Lily (*Zantedeschia aethiopica*), Dock (*Rumex* spp.), *Gladiolus* sp., Soursob (*Oxalis pes-caprae*) and *Paspalum* spp. The native vegetation persisting within the understorey, in occasional stands, is confined to various species of rushes and sedges, including *Juncus kraussii* (Shore Rush) and *Schoenoplectus validus* (Lake Club Sedge).

Stream cover: There is frequent stream cover offered by the narrow fringe of native vegetation, providing areas of permanent shade within the river in the lower reaches of the waterway. The stream cover becomes more infrequent towards the eastern end of the section. Deciduous trees such as the Edible Fig provide only seasonal shading. The instream rushes and sedges including the introduced Bulrush (*Typha orientalis*) provide some cover. Leaf litter and branches also provide limited cover within the stream.

- Focus weed control activities on the declared Cotton Bush which is toxic to stock, ensuring that people undertaking its removal wear gloves and are careful not to get any milky sap on their skin or in their eyes.
- Cut down weed tree species including Japanese Pepper, Castor Oil, Edible Fig and Olive trees and paint the stump with a systemic herbicide within 2 minutes of finishing the cut.
- Ensure any removal of large weed trees is conducted in the appropriate manner so as to prevent destabilisation of the riverbanks.
- Monitor and treat any regrowth of these trees.
- Undertake broadscale weed control activities where there is sufficient commitment to ensure the work will be ongoing, using techniques suggested in Appendix 2.
- Revegetate any foreshore areas where successful weed control has occurred, using appropriate native species (Appendix 3).
- Aim to increase the width of existing fringing vegetation, using species from under, middle and upperstorey (Appendix 3).
- Remove introduced Bulrush and replace with native rush and sedge species.
- Encourage planting of native rushes and sedges along the river banks.
- Determine the feasibility of excluding stock from the riparian zone.
- Fence any revegetation works to protect them from indiscriminate grazing.

- Retain instream features for the provision of cover.
- Extend the fringing and instream vegetation in areas lacking native vegetation cover.
- Remove the deciduous components of the stream cover, in accordance with the suggested methodologies (Appendix 2).



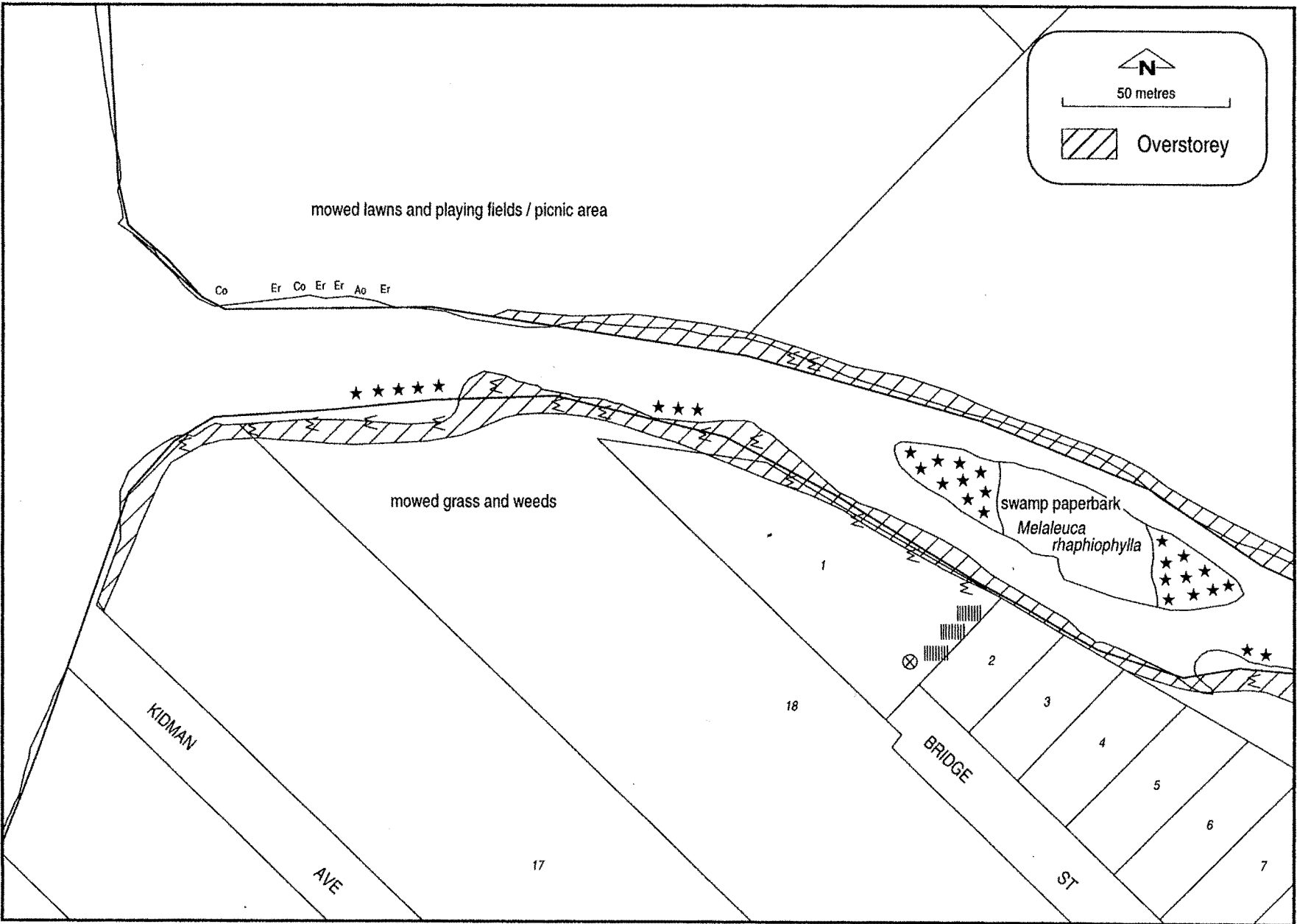
Habitat diversity: There is permanent water within the river section. The depth of the river increases towards the confluence with the Swan River. The water is brown in colour, due to high turbidity levels. Wildlife observed during the survey include ducks and frogs and some domestic geese. Along the length of the section there is a variety of vegetation types and protected basking sites acting as habitat for a variety of terrestrial invertebrates and reptiles. Trees and rushes provide habitat for birds.

Other issues: There are infrequent areas in which rubbish has been dumped, along the section. The dumping of garden waste has resulted in rambling roses growing within the foreshore vegetation. The main river channel has been diverted (trained), at some time in the past, east from Map 7. This diversion has resulted in seasonal flow within the original channel. The excavated channel exhibits greater signs of erosion and a lower frequency of vegetation occurrence than the original channel. Stock within this section have direct access to the banks of the channel.

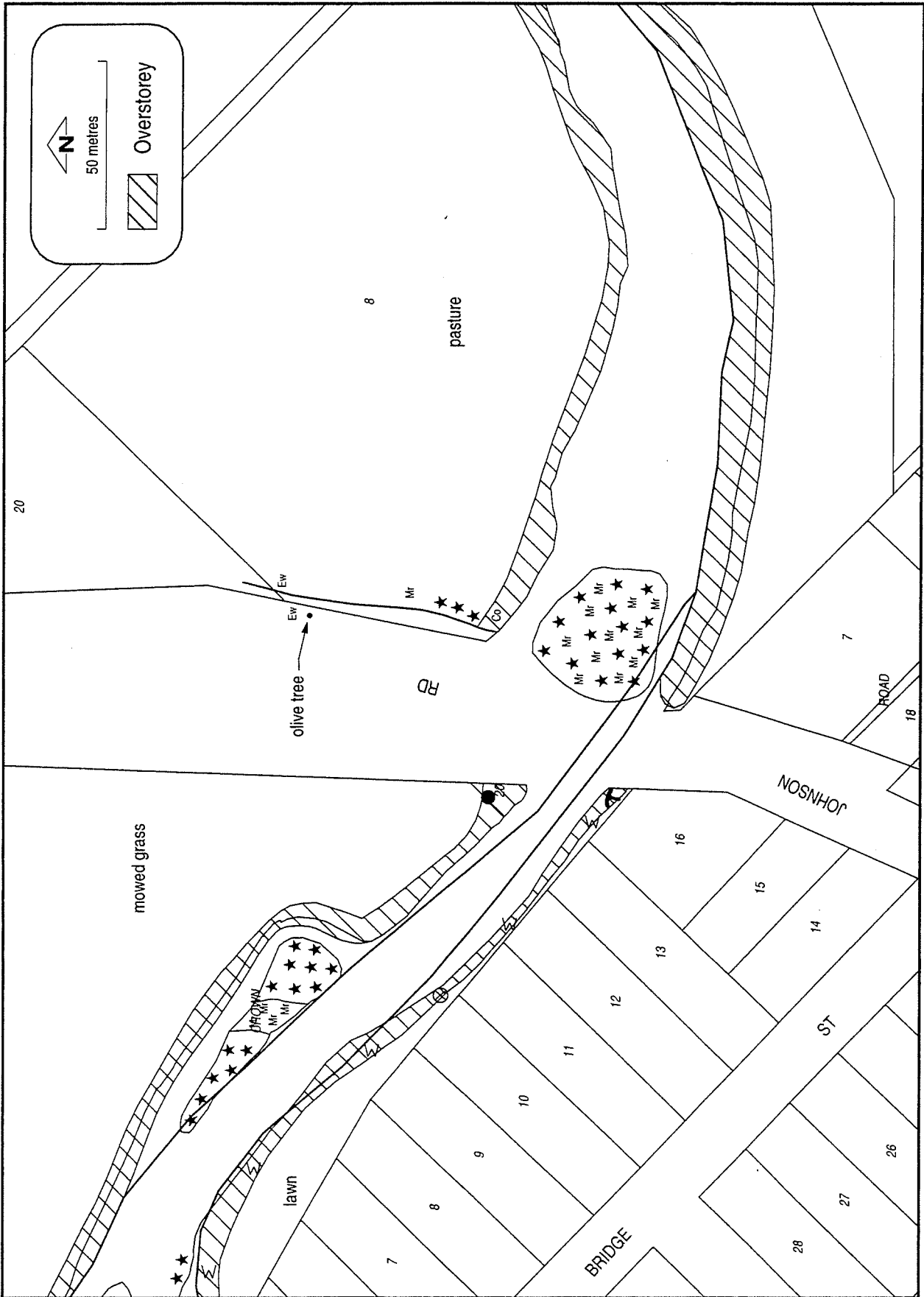
- Increase the width of the fringing vegetation, to provide a better habitat refuge.
- Prevent direct stock access to the banks of the river, decreasing the incidence of erosion and subsequent turbidity levels.
- Maintain instream habitat features.
- Replace exotic instream vegetation with native species in bands to ensure provision of habitat and erosion control capability.
- Assess the feasibility of controlling the geese and any domestic ducks.

- Investigate the main sources of the rubbish within the section, and attempt to reduce the amount entering the river.
- Remove garden exotics from the river section.
- Provide "Advice to river residents" brochures to all landholders adjoining the foreshore.
- Contact the Water and Rivers Commission to investigate the possibility of diverting the river flow back to the original channel, including an assessment of the hydrology of the entire catchment and main waterway.
- Work with landholders to encourage fencing off and management of the foreshore.



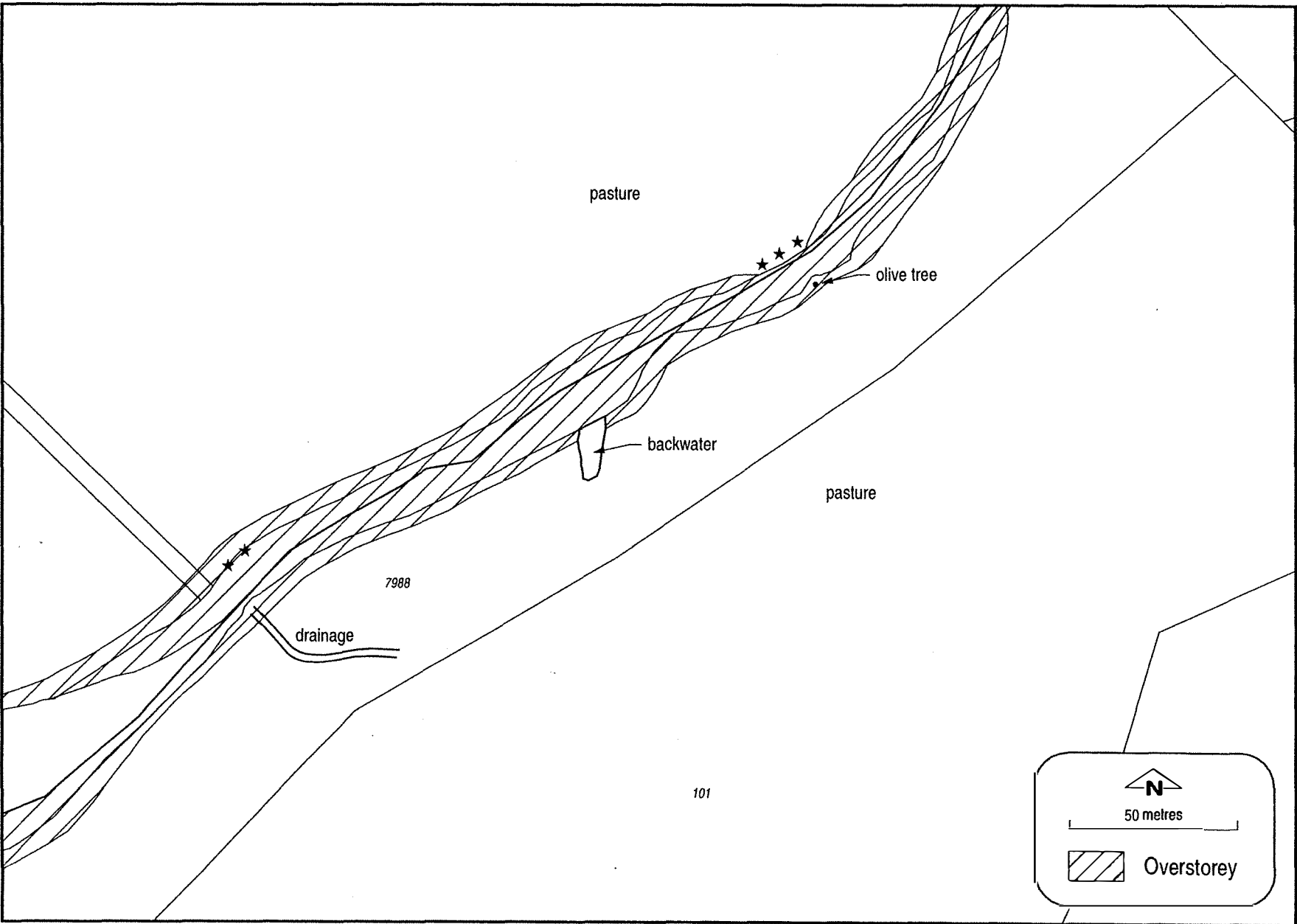


Kidman Ave, Helena River Site 4: Map 1

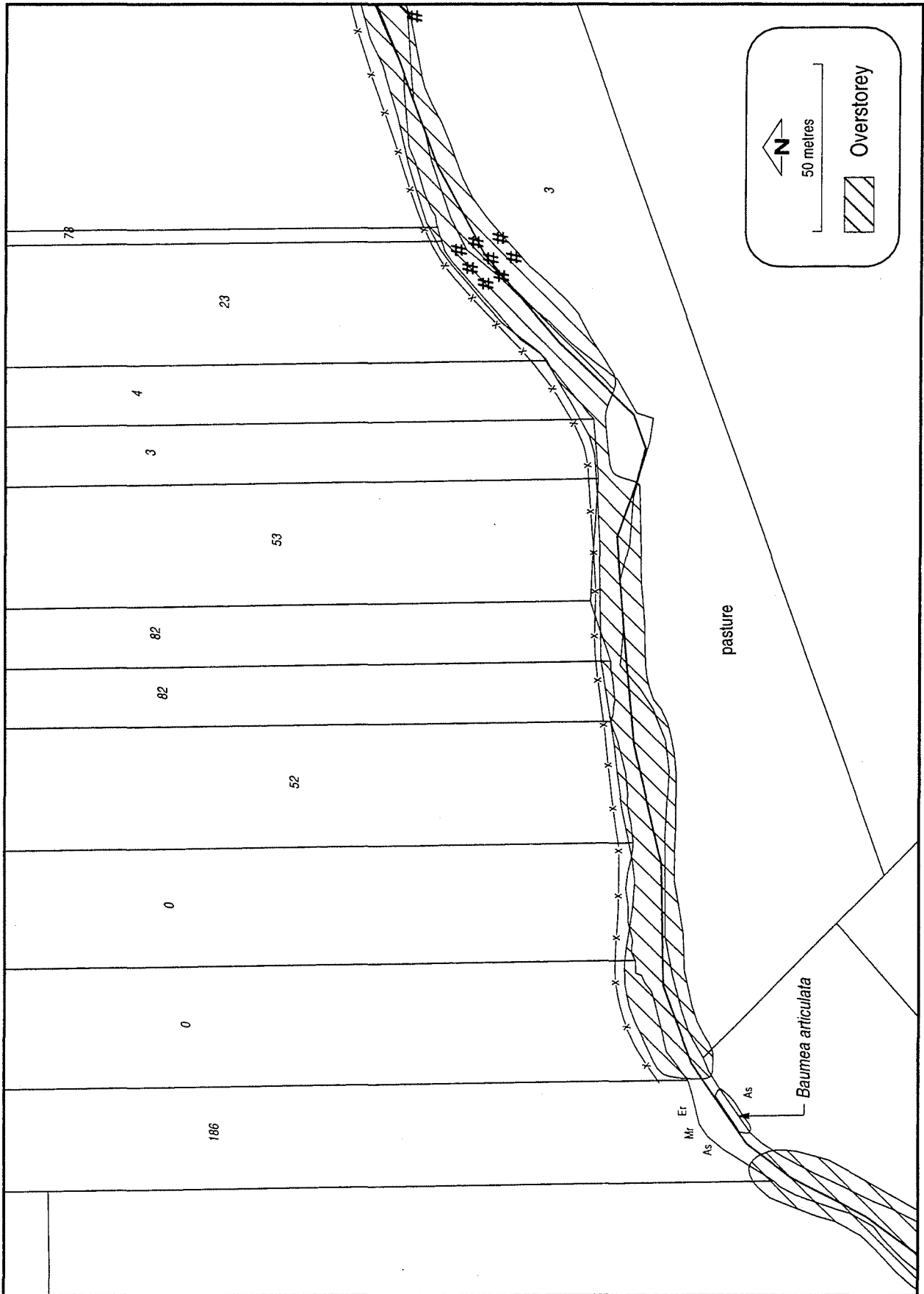


Kidman Ave, Helena River Site 4: Map 2



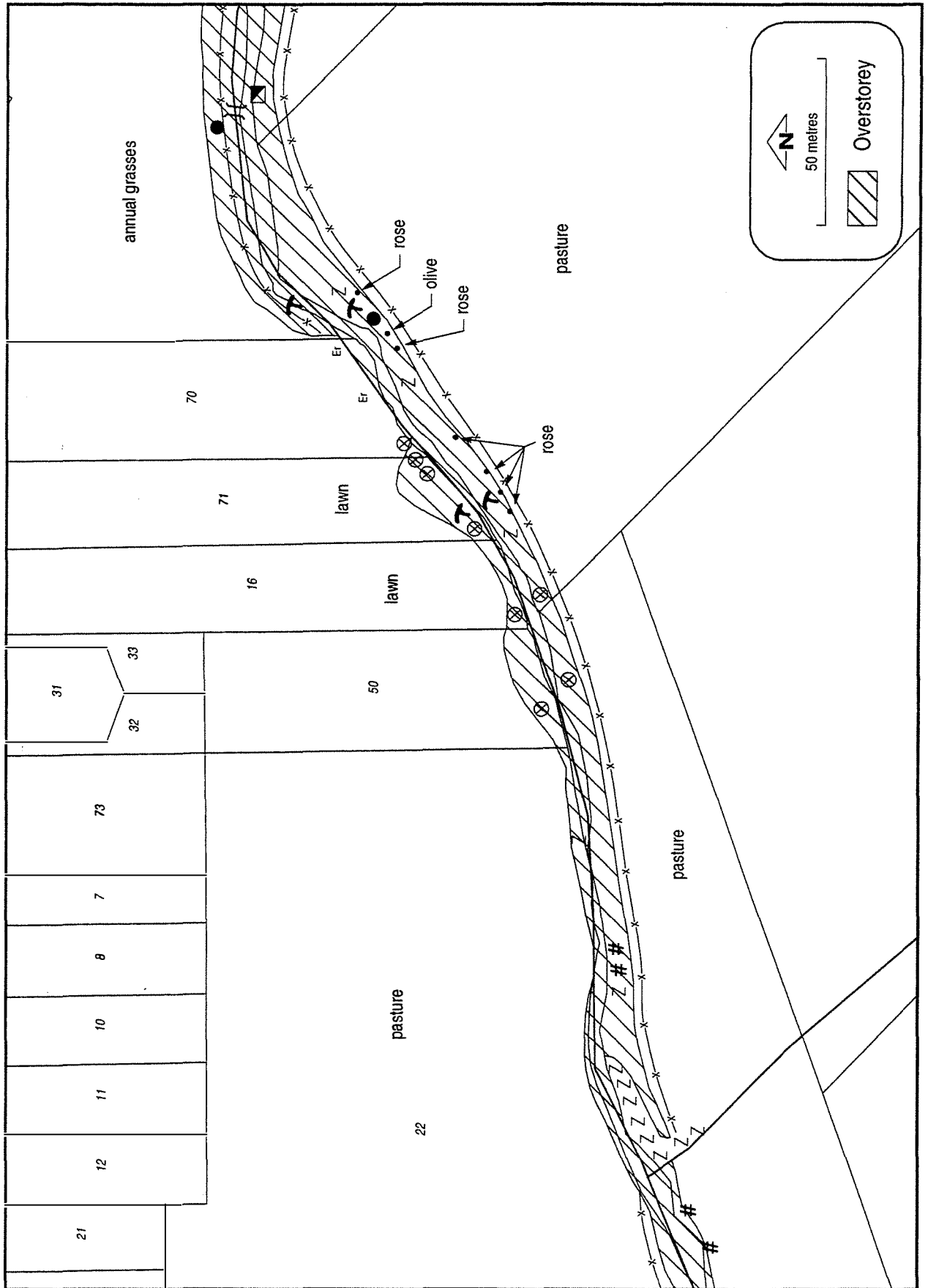


Kidman Ave, Helena River Site 4: Map 3



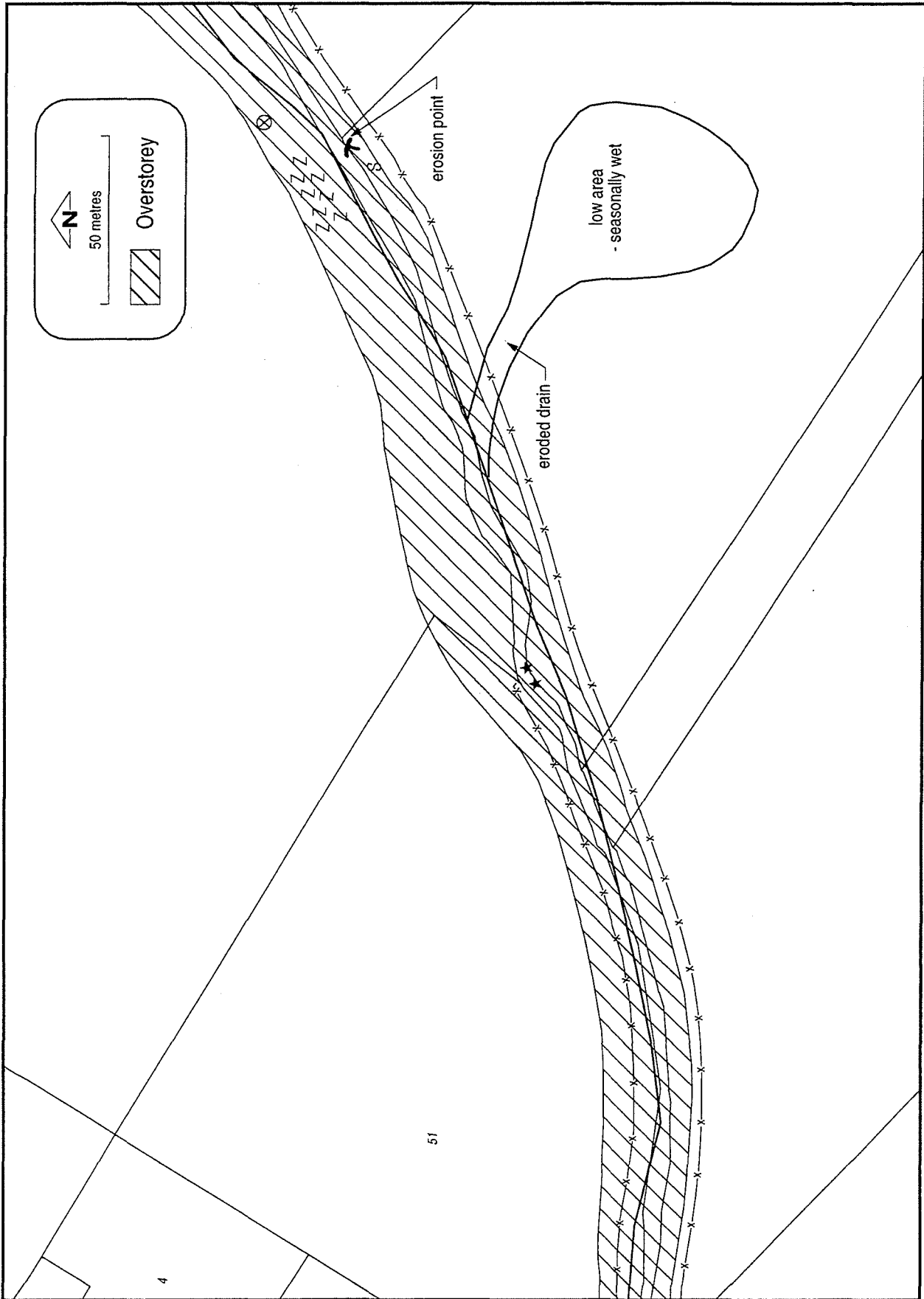
Kidman Ave, Helena River Site 4: Map 4





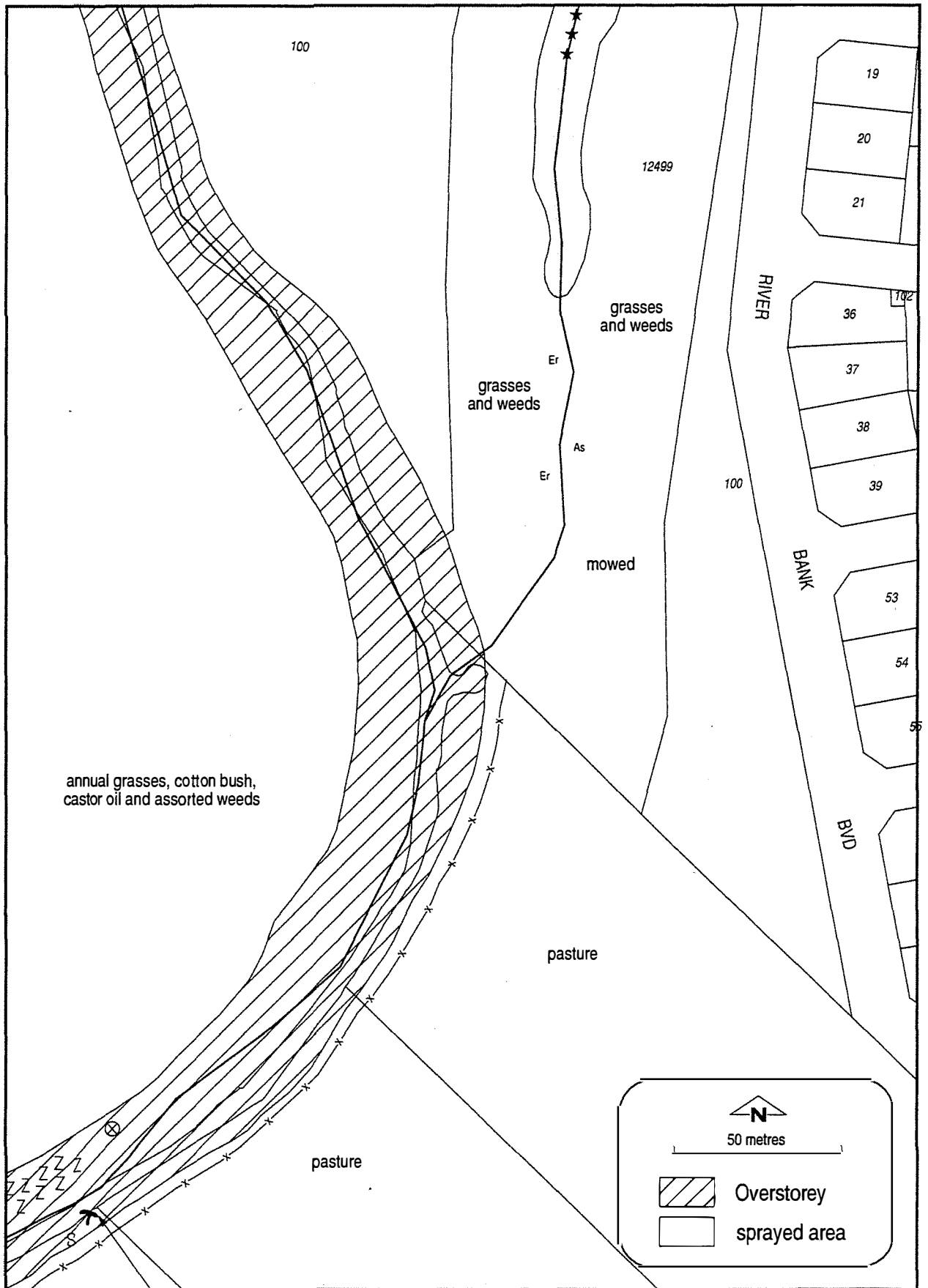
Kidman Ave, Helena River Site 4: Map 5





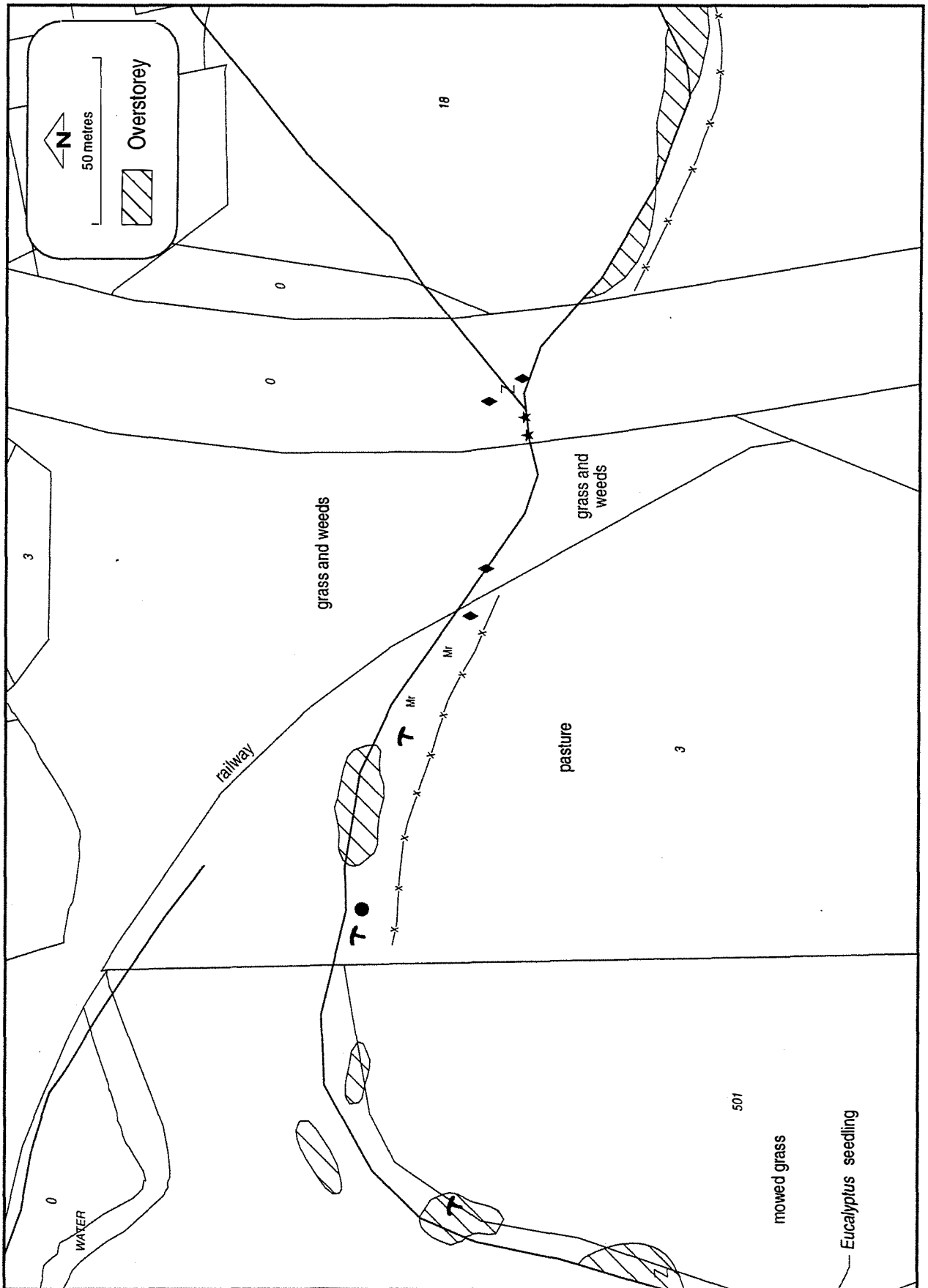
Kidman Ave, Helena River Site 4: Map 6





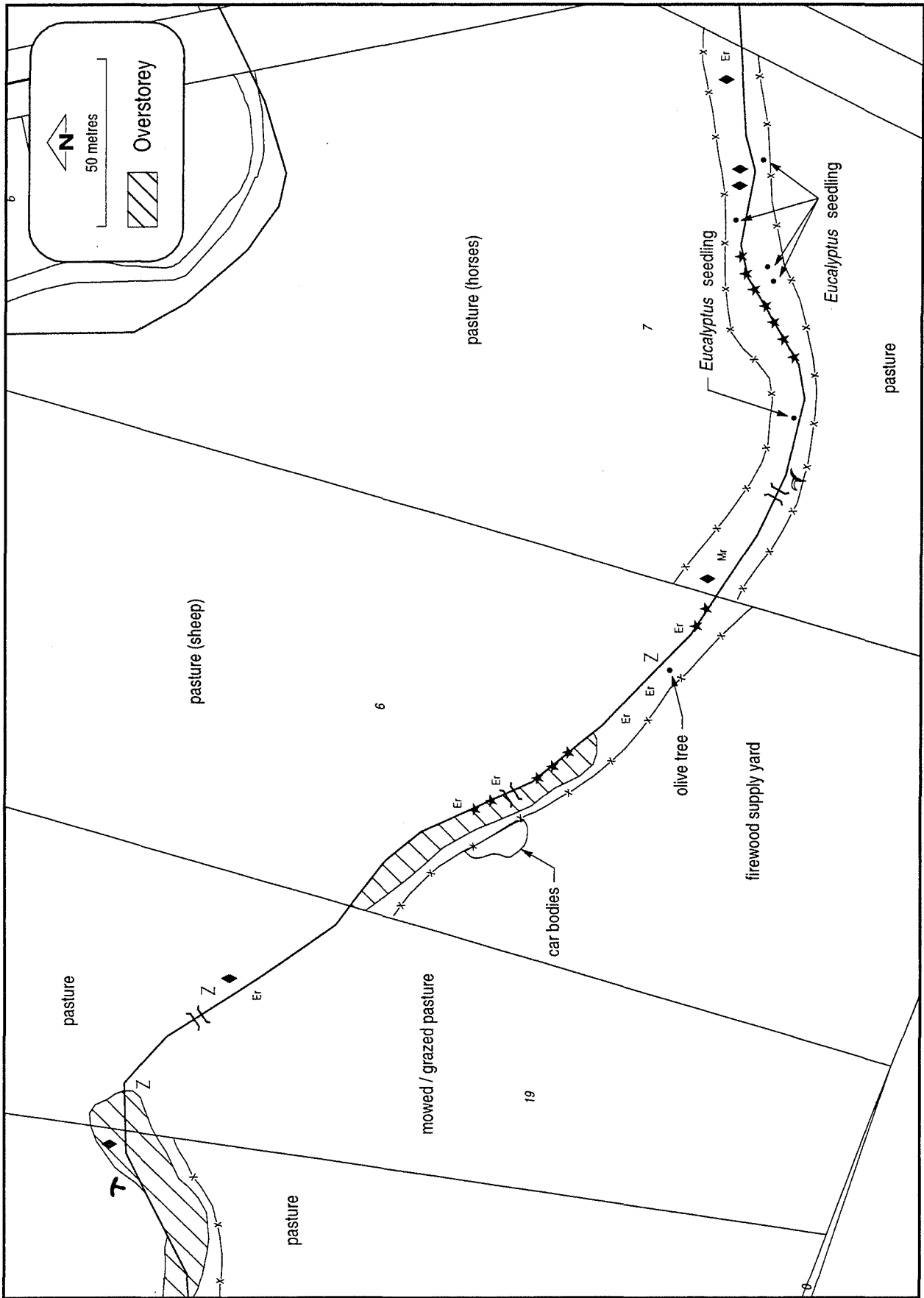
Kidman Ave, Helena River Site 4: Map 7





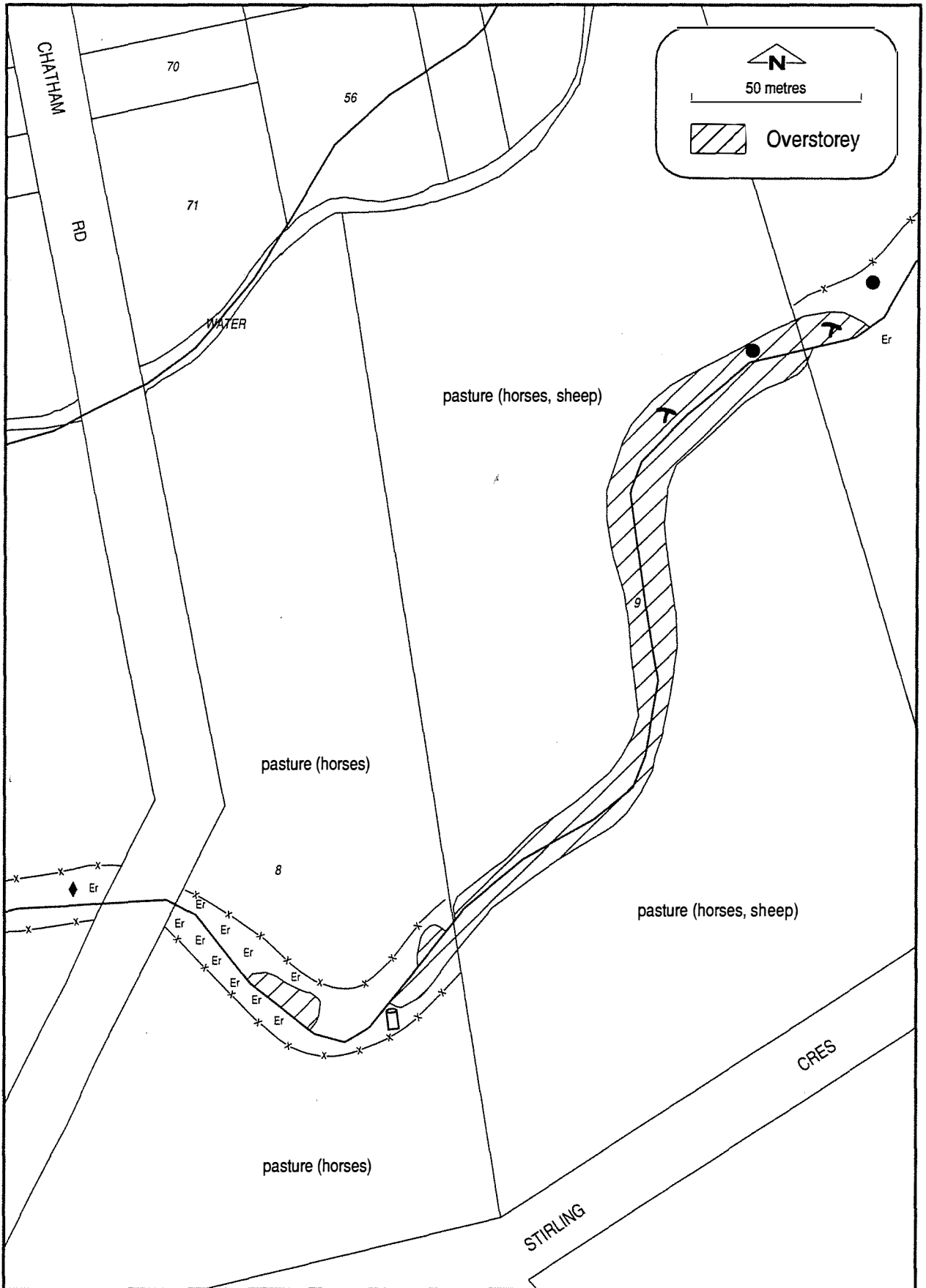
Kidman Ave, Helena River Site 4: Map 9





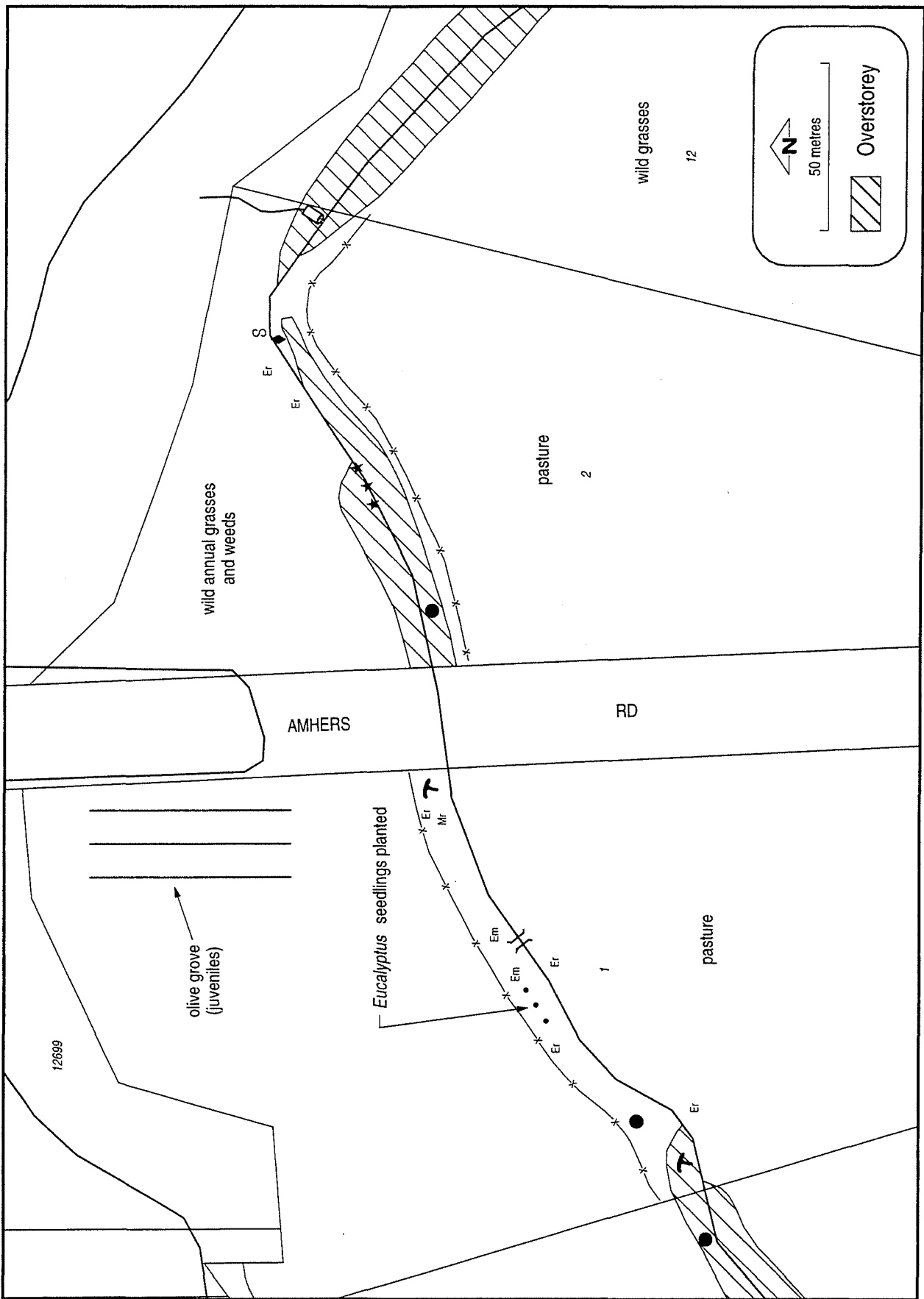
Kidman Ave, Helena River Site 4: Map 10





Kidman Ave, Helena River Site 4: Map 11





Kidman Ave, Helena River Site 4: Map 12



4.6 Scott Street Helena River

Results Foreshore Condition Survey

A Study undertaken on behalf of
Water and Rivers Commission and the Natural Heritage Trust



Helena – Site 5: Maps 1-5 Scott Road, Helena River

Length of section (m): 600 m
 Recorder's name: B Wainig
 Date surveyed: 2/7/99
 Nearest road access: Scott Road / Helena Valley Road
 Lot number(s):

Summary of river health:

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity	Stream Condition
Red	Red	Yellow	Red	Red
Poor	Poor	Moderate	Poor	Poor
2	2	4	2	10

Description

Bank stability: This section of the Helena River varies from 1 to 3 m in width. The banks range between 15 – 60° in gradient and increase to a height of 3 m, often with one bank higher and steeper than the other. There are localised occurrences of erosion and slumping along the section, especially on the outside of river bends. Localised areas of sedimentation create areas of reduced stream flow, characterised by coarse sandy sediments present in the base of the channel. Stormwater drainage discharge points enter the river periodically and have created localised areas of erosion and scouring.

Vegetation: There is a continuous level of cover in all of the overstorey, middlestorey and understorey strata. However, the vegetation occurs in a narrow strip generally extending to less than 15 m either side of the river. Only the overstorey is dominated by native species (80% cover), while the middlestorey and understorey contains only 20% and 5% native species respectively. *Eucalyptus rudis* (Flooded

Recommended Strategies

- Approach the Water and Rivers Commission to assess the hydrological features of this catchment to determine the waterway ability to cope with higher flows.
- Liaise with the local government authority to construct open rock spillways from the outflow pipes leading to an open rock apron or other erosion control features.
- Liaise with the Water and Rivers Commission and the Department of Environmental Protection to investigate the major disturbances from which coarse sandy sediments arise, and control as deemed necessary.
- Revegetate the foreshores with appropriate locally derived species.
- Employ the use of soft engineering techniques for stabilisation of banks during the revegetation works (Appendix 4).
- Focus control activities on weeds such as Cotton Bush, Bridal Creeper, Blackberry, Figs, Japanese Pepper and Watsonia ensuring that every effort is made to protect workers from getting sap from the Cotton Bush on their skin or in their eyes.



Gum) and *Melaleuca raphiophylla* (Swamp Paperbark) are frequent overstorey trees while *Corymbia calophylla* (Marri) is less common. Weed trees include frequent Edible Fig (*Ficus carica*), while Japanese Pepper (*Schinus terebinthifolia*) and Olive (*Olea europaea*) trees are more scattered. The native component of the middlestorey comprises infrequent occurrences of *Acacia saligna* (Coojong), *A. pulchella* (Prickly Moses), *Trymalium ledifolium* and *Viminaria juncea* (Swishbush). Weed species include abundant Blackberry (*Rubus fruticosus*) and frequent Cotton Bush (*Gomphocarpus fruticosus*) and Giant Reed (*Arundo donax*). The understorey is dominated by weed species including *Watsonia* (*Watsonia bulbifera*), Bridal Creeper (*Asparagus asparagoides*), Soursob (*Oxalis pes-caprae*) and Kikuyu (*Pennisetum clandestinum*). Infrequent occurrences of native rushes and sedges, including *Juncus kraussii* (Shore Rush), are the only native species observed in the understorey. There is evidence of attempts to control the *Watsonia* infestation. While spraying of a non-selective systemic herbicide has reduced the extent of *Watsonia*, it has also denuded the native middle and understorey species.

Stream Cover: There is abundant stream cover offered by the fringing vegetation, providing permanent shade within the river. However, the presence of occasional exotic deciduous trees may reduce cover due to seasonal leaf drop. The river contains leaf litter, branches and vegetation which provide instream cover for aquatic organisms.

Habitat diversity: The water within the river is not permanent. The depth of the river ranges from approximately 10 cm to 20 cm (further upstream near Scott Road bridge). There are some pools within the section, which retain deeper water. There is no apparent turbidity within the river, but tannins give a slightly discoloured appearance to the water. There is some variety within the vegetation types present, offering habitat to terrestrial animals. This habitat value would be greater under diverse native flora cover. Wildlife observed during the survey included ducks and rabbits.

- Remove and control weed species, using suggested methods (Appendix 2) in localised nodes to ensure that broadscale habitat removal does not occur and also to ensure that there are sufficient resources to maintain the weed control effort.
- Revegetate the foreshore with appropriate locally derived plant species (Appendix 3).
- Integrate weed control activities with revegetation programs.
- Coordinate revegetation and weed suppression activities along the river section to prevent re-invasion by weeds from upstream.
- Work with the local government authority to undertake foreshore restoration activities on a catchment scale level.
- Construct fencing to exclude stock from the revegetated areas.
- When using toxic herbicides, ensure that correct application practices and rates of application are used.

- Remove deciduous components of the fringing vegetation.
- Remove weed species, such as the dominant Blackberry, and replace with appropriate native species to provide continuous levels of stream cover (Appendix 3).
- Increase the occurrences of established instream vegetation, such as native rushes and sedges.

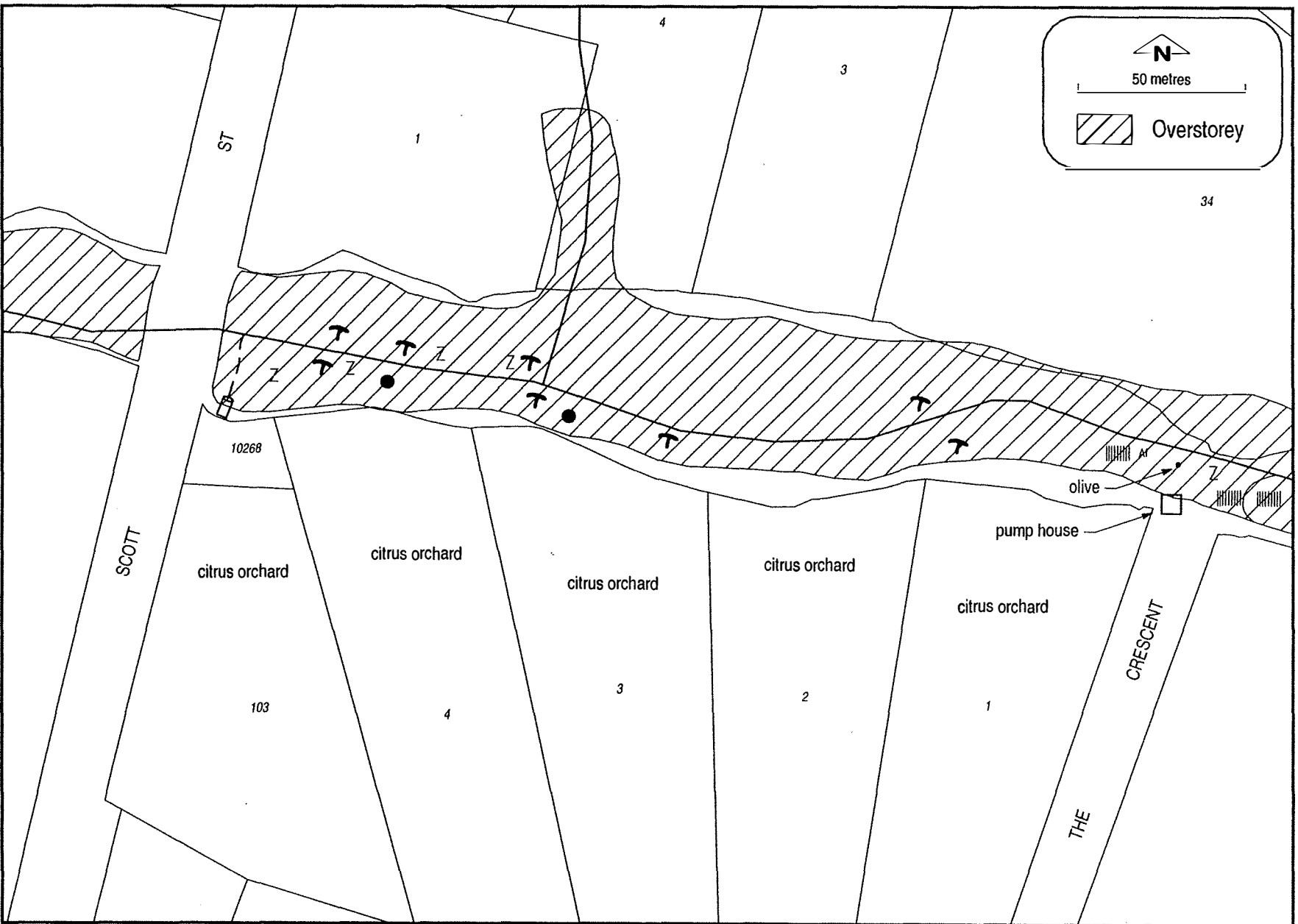
- Revegetate the foreshores to increase habitat value.
- Retain fallen logs and branches to enhance habitats where they do not exacerbate erosion.
- Encourage the Department of Conservation and Land Management and the local government authority to establish a rabbit and other feral animal control program.
- Ensure that weed control and revegetation works are implemented in nodes to ensure that there are continuous corridors for fauna to move through.



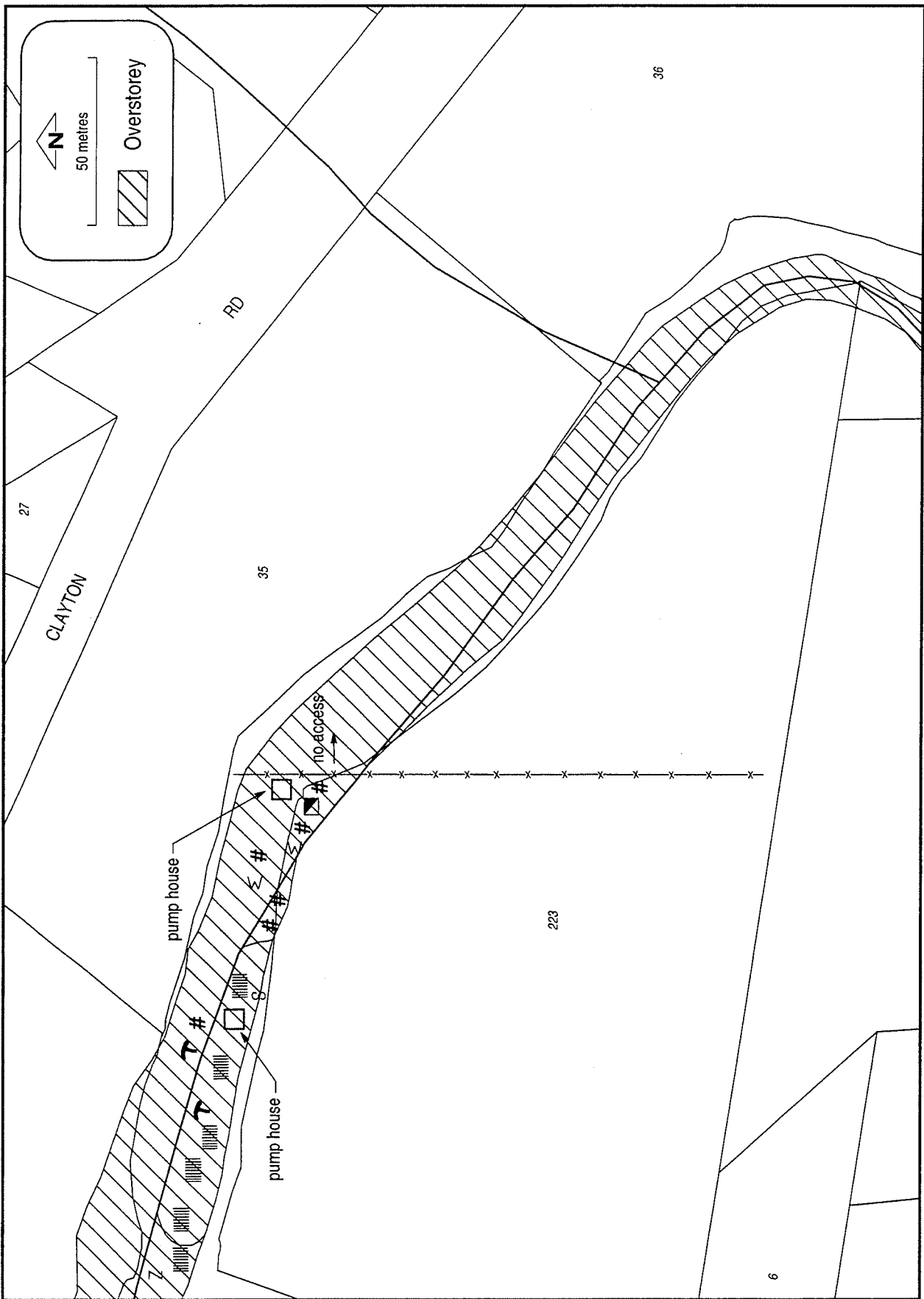
Other issues: This section of the river passes through a variety of land use types, from residential to semi-rural and council reserve. There are some orchards along the section, which may be contributing chemical residues, such as fertiliser and pesticides, to the river. Sown pastures and horses are present along the foreshore area. There are at least four extraction pumps, which are likely to be extracting water for irrigation purposes. There is little evidence of active foreshore management by most landholders, apart from one property, where herbicide application has been used to aid in the control of *Watsonia*.

- Work with local landholders and the Water and Rivers Commission to develop suitable foreshore management procedures for the community surrounding this section of the river.
- Provide pamphlets to landholders to encourage their active participation in management of their waterway.
- Encourage the Water and Rivers Commission to investigate the volume and quality of water drawn from the pumps located along the section, to ensure that it is within regulated quantities and that landholders are not contravening the relevant water Acts.



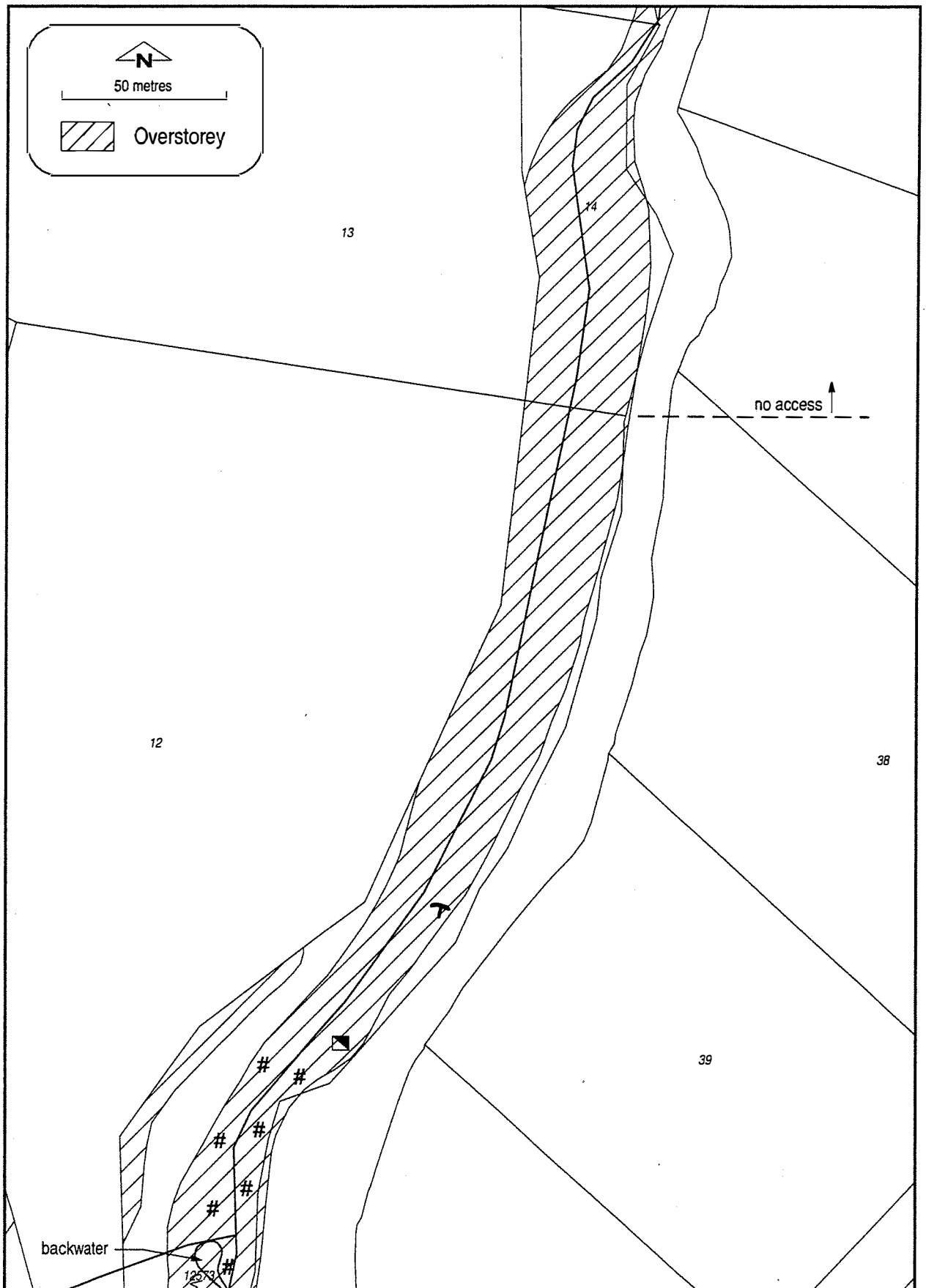


Scott Road, Helena River Site 5: Map 1



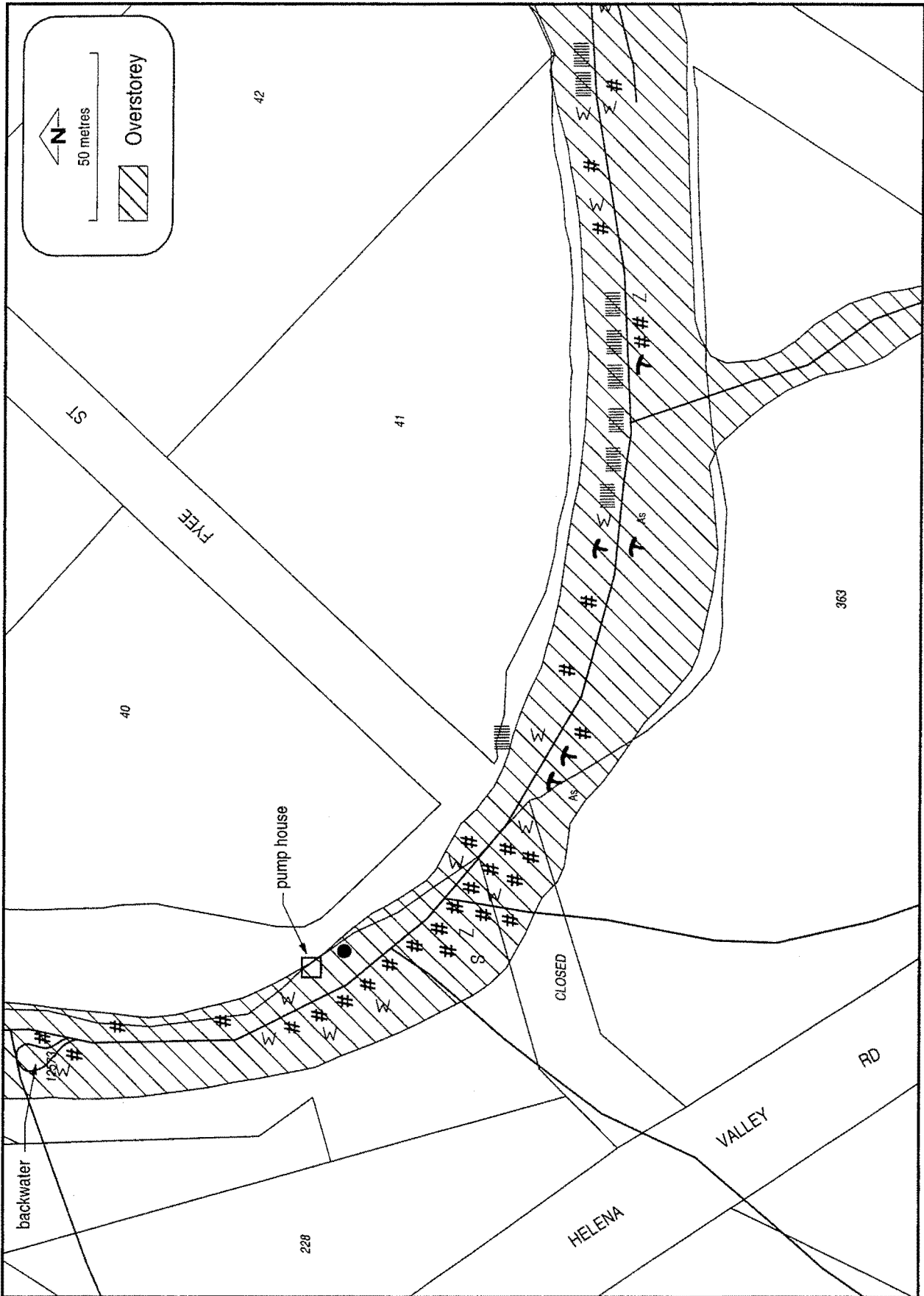
Scott Road, Helena River Site 5: Map 2





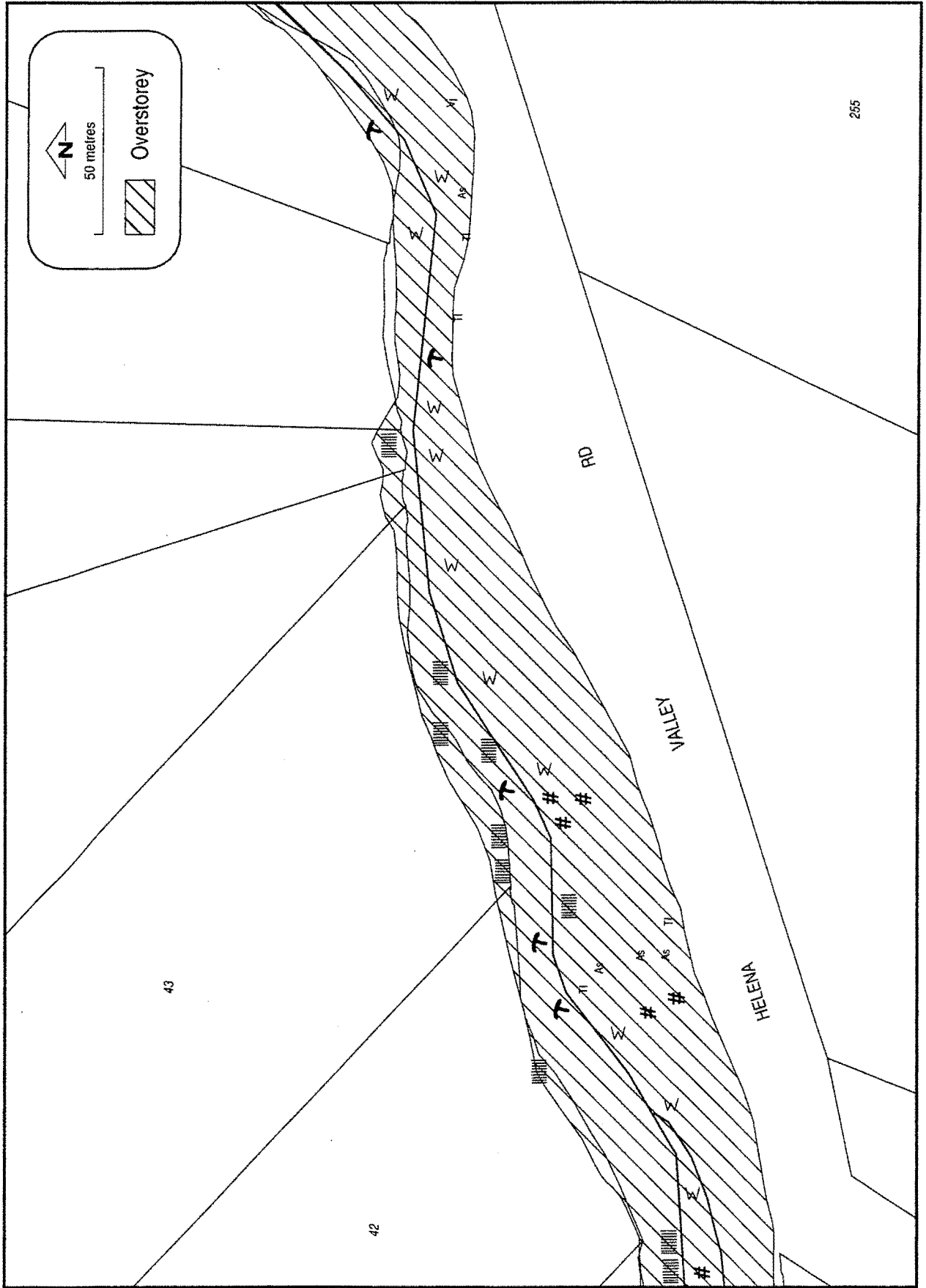
Scott Road, Helena River Site 5: Map 3





Scott Road, Helena River Site 5: Map 4





Scott Road, Helena River Site 5: Map 5





4.7 Chittawarra Brook

Results Foreshore Condition Survey

A Study undertaken on behalf of
Water and Rivers Commission and the Natural Heritage Trust



Helena – Site 6: Maps 1-4 Chittawarra Brook

Length of section (m): 1630 m
 Recorder's name: B Waining
 Date surveyed: 25/6/99
 Nearest road access: Hardey Road – Glenburn Road
 Lot number(s): 72

Summary of river health:

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Black	Red	Black	Red
Very Poor	Poor	Very Poor	Poor
0	2	0	2

Stream Condition
Black
Very Poor
4

Description

Bank stability: This section of Chittawarra Brook extends from the confluence with Helena River upstream to the Glenhantly Stud. The majority of the brook is an incised channel, running through pastured land. The main channel is up to 1 m in depth and 2 m in width, with local variation to these dimensions. Both banks are steep, to $>60^\circ$, and open out onto a floodplain. One section of the brook flows over a steep sided rocky outcrop, where no floodplain exists. There are significant levels of erosion and slumping along this section of the brook, with 20-50% of the section affected. Erosion and scouring are also evident at the outflow of the dam, which is situated approximately half way along the section and at the confluence with Helena River. No significant efforts have been made to control erosion or scouring. Sedimentation is confined to localised occurrences, particularly around the dam located in the middle of the survey section. At the northern end of this section there are stormwater drains entering from under the road. These drains are perched above the creekline and are creating erosion at the outflow points. Grazing llamas and domesticated kangaroos have free access to the banks of the creek and dam, which may have a destabilising effect on the banks.

Recommended Strategies

- Fence off the brook and dam to prevent stock access.
- Construct alternative watering points for the stock away from the foreshore area.
- Liaise with the local government authority and the Water and Rivers Commission to develop open rock spillways from the outflow pipes leading to an open rock apron or other erosion control features.
- Work with the local government authority and the Water and Rivers Commission to address the incidences of scouring and erosion and to prevent further occurrences, by installing instream open riffle structures to slow water flows.
- Work with the landholder to redesign the dam outflow to reduce the incidence of erosion and scouring.
- Undertake weed removal and control, ensuring that the banks are not further destabilised.
- Revegetate to help prevent bank destabilisation, especially on the outside of stream bends.



The vegetation comprises a patchy overstorey, sparse middlestorey and a continuous understorey. Native species make up 80% of the overstorey cover, and include frequent occurrences of *Corymbia calophylla* (Marri) and occasional *Eucalyptus rudis* (Flooded Gum). There are also weed trees present including occasional Radiata Pine (*Pinus radiata*), Edible Figs (*Ficus carica*), with rare occurrences of Willows (*Salix* sp.) and Olive Trees (*Olea europaea*). Some deciduous Oak trees have been planted close to the brook. The native component of the middlestorey comprises occasional to infrequent occurrences of *Acacia pulchella* (Prickly Moses), *A. saligna* (Coojong), *Agonis linearifolia* (Swamp Peppermint), *Hakea cristata* (Snail Hakea), *Trymalium ledifolium* and *Xanthorrhoea preissii* (Grass Tree). Weed species present within the middlestorey include occasional to infrequent occurrences of Cotton Bush (*Gomphocarpus fruticosus*), Castor Oil (*Ricinus communis*) and Tagasaste (*Cytisus proliferus*). The understorey is dominated by weed species including pasture grasses, Soursob (*Oxalis pes-caprae*), Deadly Nightshade (*Solanum nigrum*), Fleabane (*Conyza* spp.), *Watsonia* (*Watsonia bulbifera*) and Blowfly Grass (*Briza maxima*). Natives present within the understorey include infrequent occurrences of *Hakea prostrata* (Harsh Hakea), *Macrozamia reidleyi* (Zamia), *Juncus kraussii* (Shore Rush) and a *Leucopogon* sp.

Stream Cover: The stream cover along this survey section is rated as occasional as overstorey canopy cover is patchy. The presence of frequent deciduous Oaks and Willows, which do not offer any cover during the winter months further limit the lack of healthy, continuous cover along foreshore banks. Within the stream there is some leaf litter, rocks, branches and vegetation providing instream cover.

- Encourage landholders to fence off their riparian zone and use it for crash grazing periodically, followed by weed control works. Aim to re-establish native fringing vegetation along foreshore and exclude stock.
- Undertake/continue weed control activities in accordance with the guidelines provided in Appendix 2.
- Hand weed or repeatedly brushcut species such as Fleabane, Blowfly Grass, Deadly Nightshade and *Watsonia* consistently over time ensuring that this occurs prior to flowering and fruiting.
- Work with landholders to monitor the spread of weeds and encourage landholders to take weed management seriously.
- Promote weed management works that will focus on Cotton Bush, Castor Oil and Tagasaste (if it is not being used for fodder), Willows and Radiata Pine, taking care to ensure that workers do not get sap from the Cotton Bush on their skin or in their eyes.
- Fence off revegetation works.

- Remove weed species from the foreshore, and revegetate the banks of the brook with appropriate native species (Appendix 3).
- Retain fallen branches and logs for the provision of instream cover where these features do not interrupt water flow or impact on bank stability.
- Fence off the foreshore from stock access, enabling regeneration of the native vegetation complex.



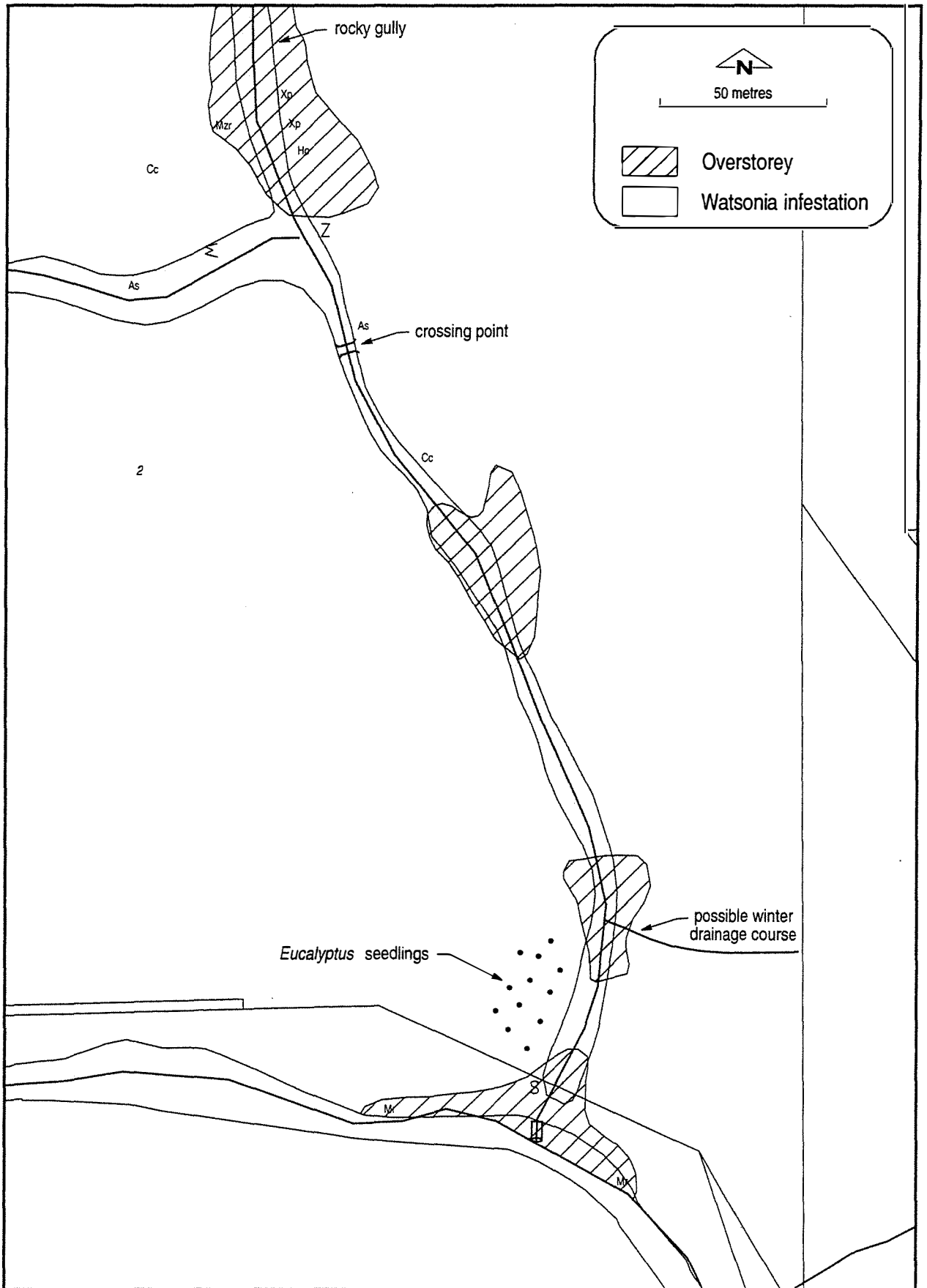
Habitat diversity: The only permanent water of the section occurs within the dam. The brook itself is shallow, <15 cm, and is a turbid light grey-brown colour. There are some protected sites for basking invertebrates and reptiles, however there is an overall lack of variety in vegetation types. The rocky outcrop provides some area of cascades and riffles as habitat for aquatic organisms. The trees provide roosting and nesting sites for some bird species. *Watsonia* provides the only dense streamside vegetation for frogs, and only exists in the southern section of the site.

Other issues: Rural lots are the predominant landuse along this survey section. Llamas and kangaroos are the main grazing livestock and they have free access to the foreshore. The kangaroos appear to be affected by disease or old age. There are also some picnic tables around the area of the dam, which are provided for the private use of the landowner and possibly customers in the tearooms.

- Liaise with the Water and Rivers Commission to trace the cause of turbidity, and address as required.
- Retain instream features, such as fallen branches, for added habitat value.
- Revegetate with a variety of native species to help provide further habitat value to the area.
- Remove and control *Watsonia*, and replace with appropriate native vegetation such as rushes and sedges.

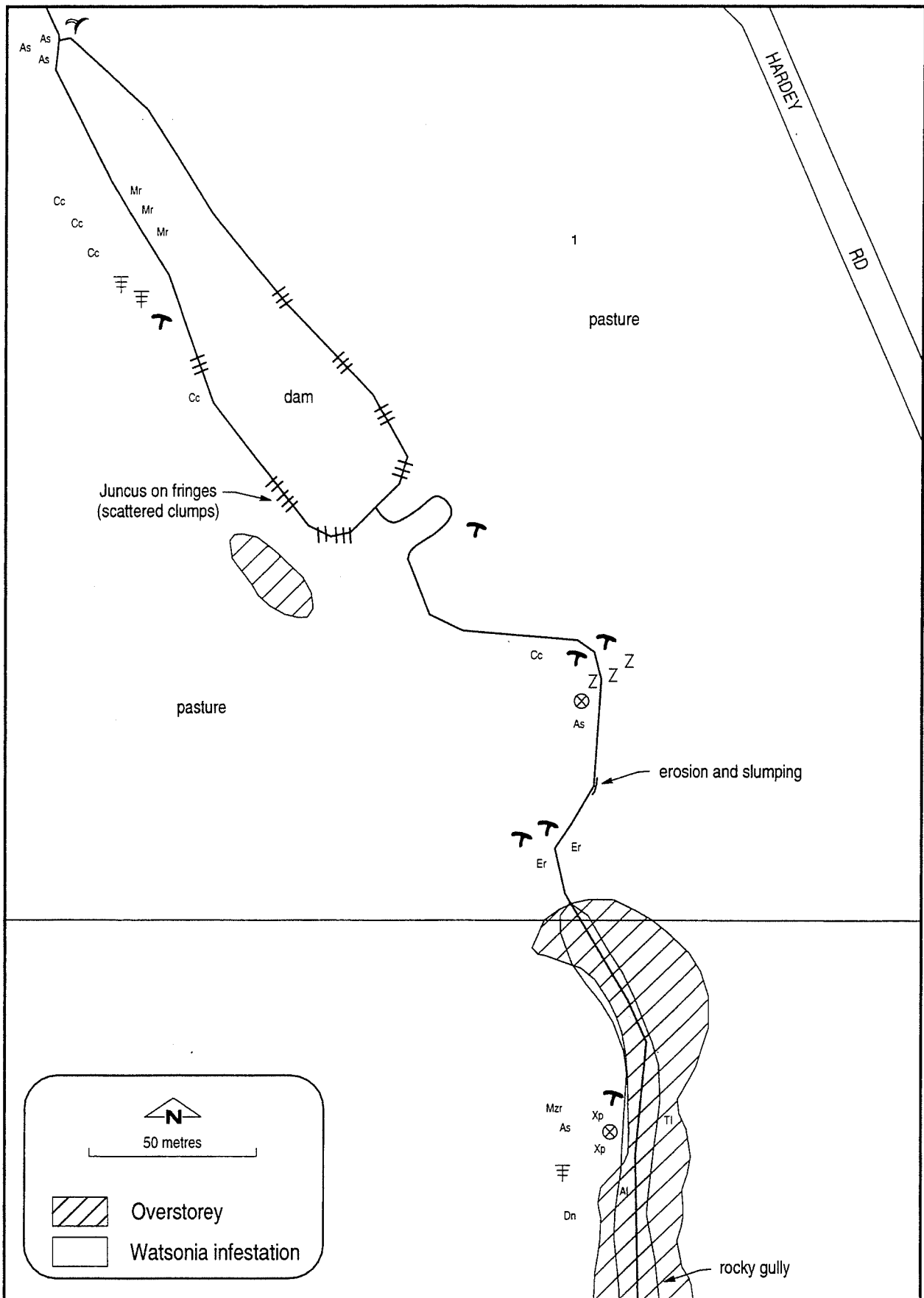
- Work with the local government authority to construct a crossing point on the most southern section to prevent further disruption to the banks within this area, using soft engineering techniques (Appendix 4).
- Fence off the foreshore to protect remnant vegetation and possibly facilitate natural regeneration.
- Determine the public use of the area.
- Liaise with the owners of the tearooms to determine if the visiting public also use the facilities.





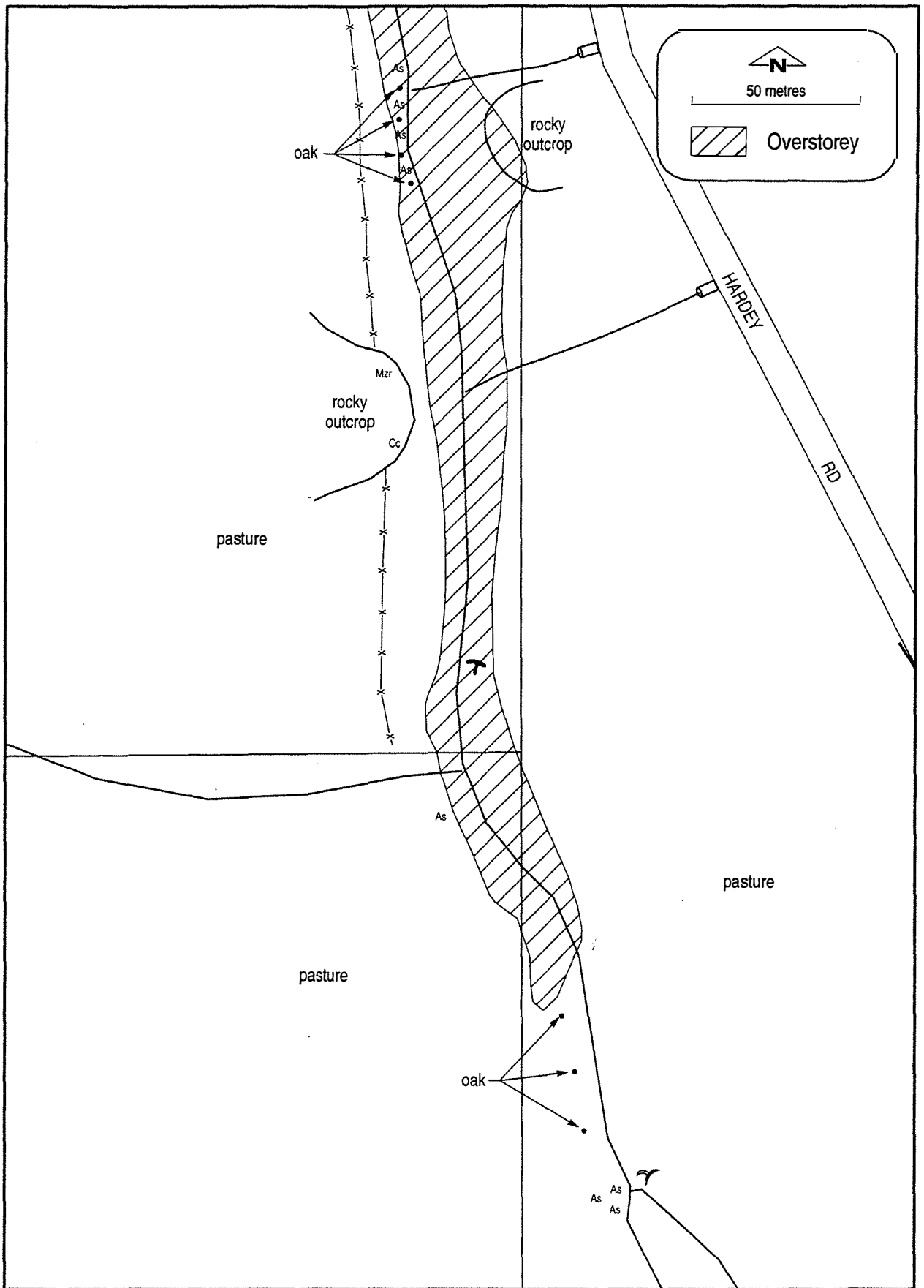
Chittawarra Brook Site 6: Map 1





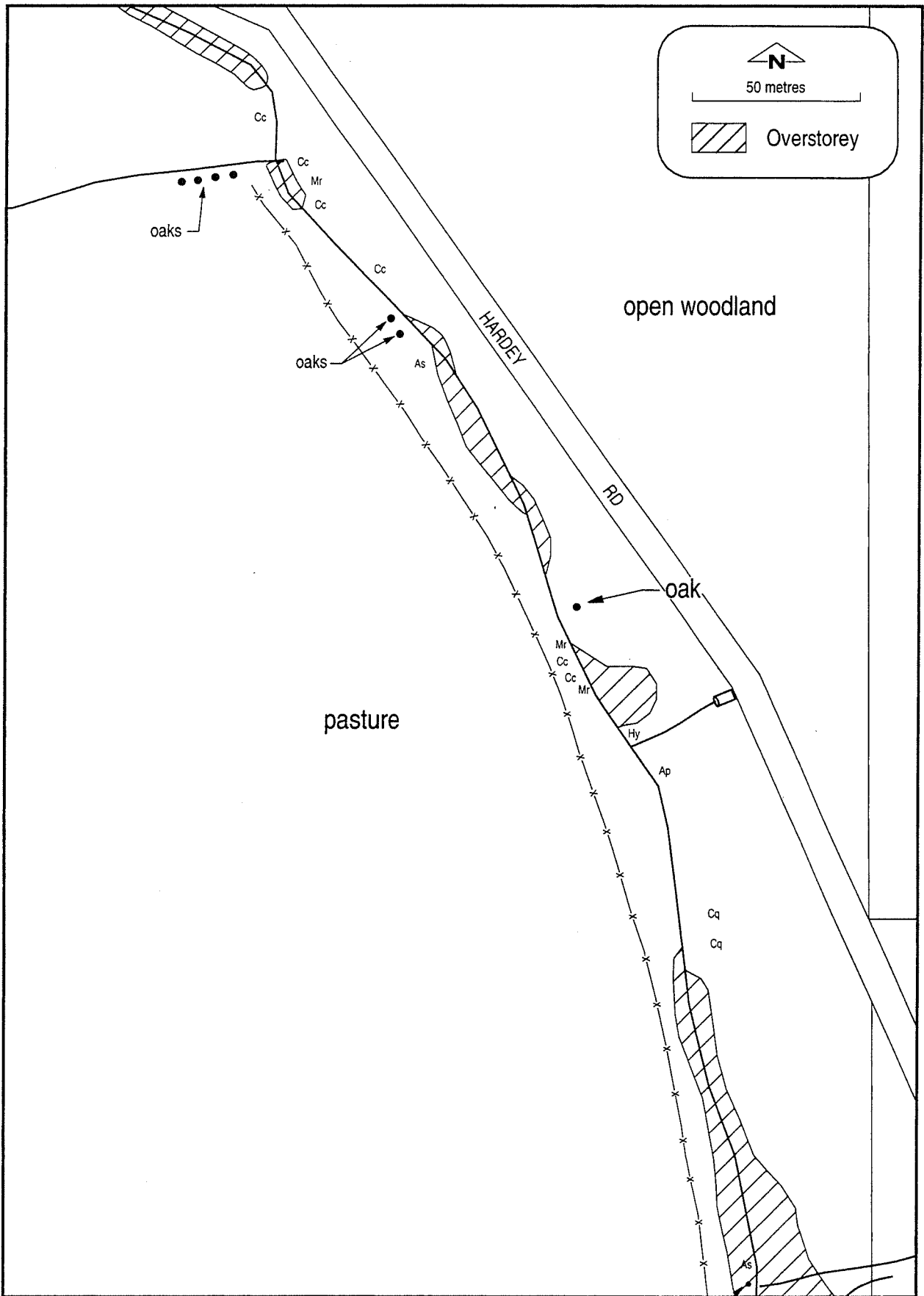
Chittawarra Brook Site 6: Map 2





Chittawarra Brook Site 6: Map 3



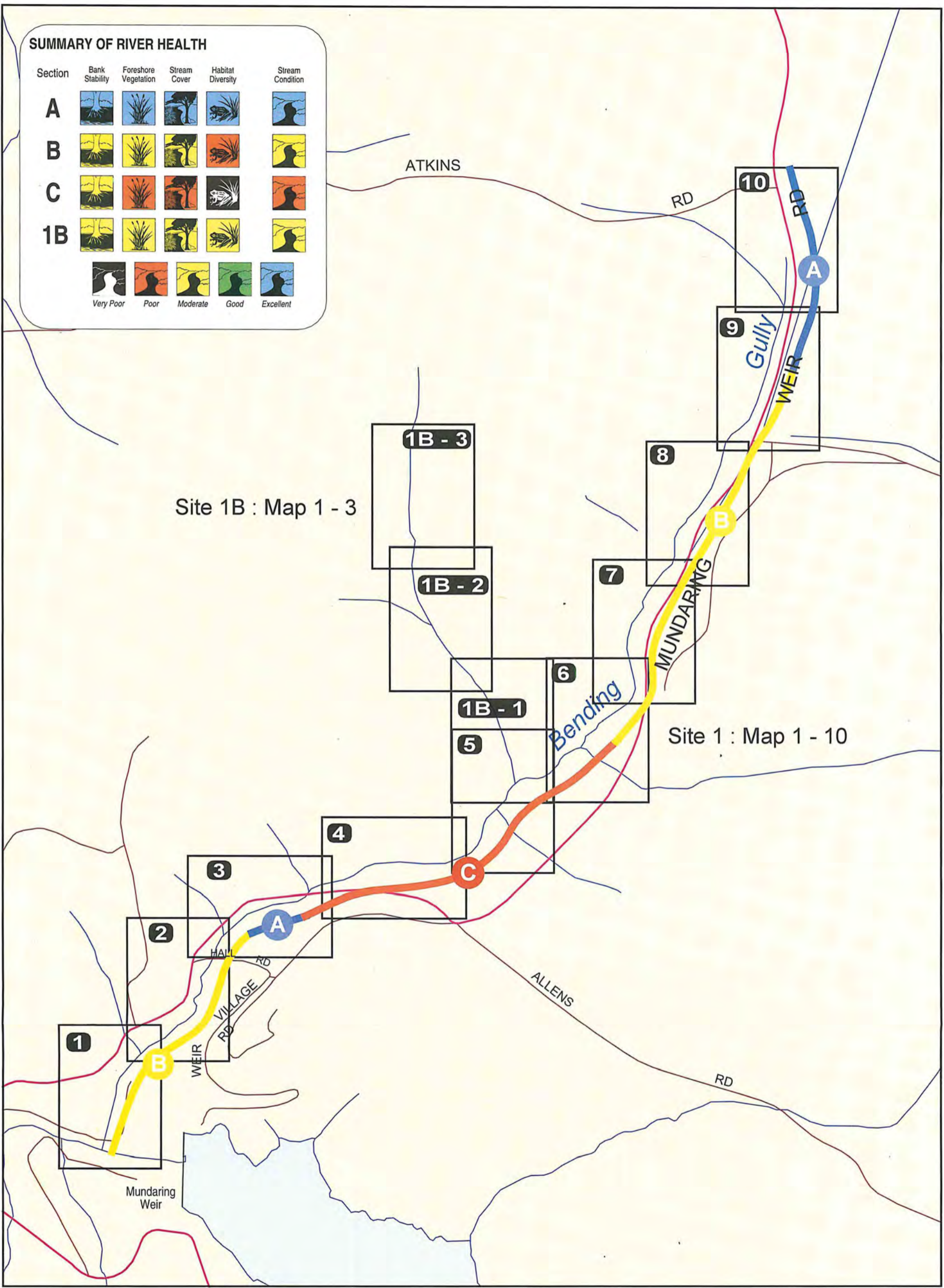


Chittawarra Brook Site 6: Map 4



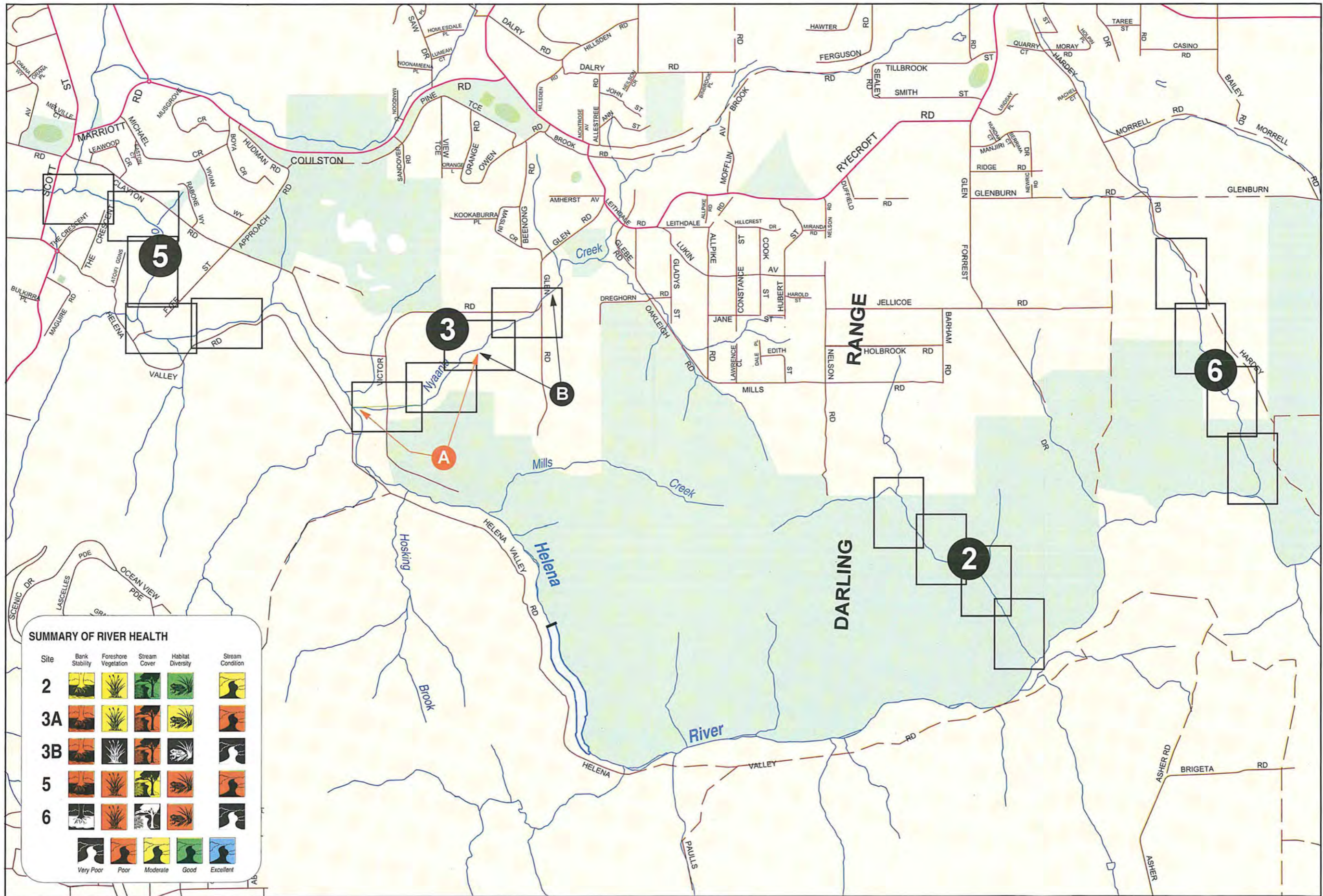
SUMMARY OF RIVER HEALTH

Section	Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity	Stream Condition
A					
B					
C					
1B					
	Very Poor	Poor	Moderate	Good	Excellent



Site 1B : Map 1 - 3

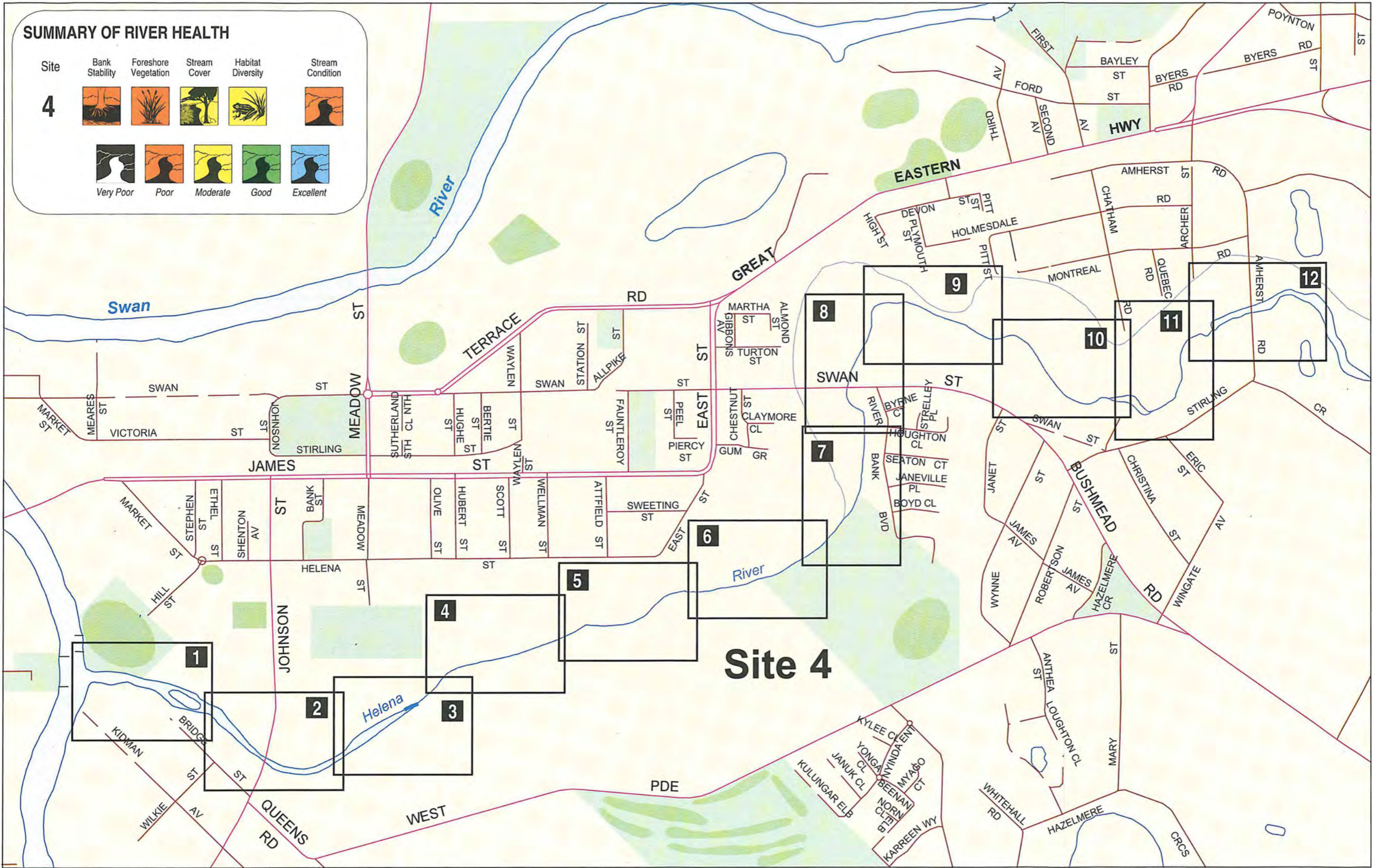
Site 1 : Map 1 - 10



Helena River Locality Map: Sites 2, 3, 5 & 6

SUMMARY OF RIVER HEALTH

Site	Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity	Stream Condition
4					
	Very Poor	Poor	Moderate	Good	Excellent



Helena River Locality Map: Site 4

5. General recommendations

A number of general recommendations apply to all of the sites. They are listed under the core activities which will be required for groups to successfully develop and implement rehabilitation strategies.

5.1 Planning

- Determine cadastral boundaries and landowner/management to ensure that they support the foreshore assessment process, and are involved in the development and implementation of any remedial strategies.
- Collate as much existing information about the focus waterway and catchment as possible.
- Focus initial foreshore assessment survey work in areas where future rehabilitation projects may be undertaken.
- Extend future foreshore assessment work from previously surveyed areas along the foreshore, eventually mapping all sites. Future surveys may also include re-assessment of earlier surveys to assess changes to the environment.
- Create herbariums of native and weed species to assist group members and other interested parties to distinguish between native and introduced plants present in the riparian zone. This could include seedlings.
- Ensure that all works are planned well in advance and that a long term strategy has been developed and is amended as new information becomes available.
- Ensure that all agencies with statutory responsibilities such as the relevant local government authority, the Water Corporation, the Water and Rivers Commission and the Swan River Trust are advised of any works within their management areas, to ensure that the works meet legislative requirements.
- Develop information brochures to increase community awareness of the importance of foreshore areas to encourage community involvement in managing their own foreshores and surrounding reserves.

- Develop an information brochure for the landholder to suggest methods of improved land management and encourage rehabilitation of the foreshore area.
- Endeavour to obtain funds from outside sources to assist both the group and any private landholders who are willing to implement rehabilitation activities.

5.2 Site preparation

5.2.1 Weed control

- Ensure weed control activities are undertaken in manageable sized nodes, reinforcing overstorey species and restoring the middlestorey and understorey species (using species recommended in Appendix 3 of this report) once weeds have been eradicated.
- Tag any native plants present to protect them from weed control activities.
- Hand weed where possible, especially annual weeds and instream weeds.
- Use a qualified herbicide operator if chemical control is undertaken near waterways.
- Always consider the impacts that weed control will have on habitat, particularly for reptiles and small mammals such as bandicoots. Maintain vegetated corridors within which animals can move until sufficient native plants have re-established.
- Ensure that all weeds are removed from the site to limit re-infestation.
- Create buffers around existing clumps of native vegetation to encourage natural regeneration of existing plants, e.g. spray Fusilade® around native rushes to control introduced grasses and enable the clumps of rushes to spread naturally.
- Ensure the impact on bank stability is considered before weed control works are undertaken. Consider the potential for use of erosion control matting as an option for reducing weed re-emergence, supporting revegetation and improving bank stability on steeper gradient banks.



5.2.2 General site preparation

- Encourage landholders throughout the rural and semi-rural catchments to fence off or delineate waterways and tributaries and implement a broadscale revegetation program.
- Provide financial support or material assistance to landholders willing to implement rehabilitation activities.
- Define access tracks to weed management areas or where there are planting programs, to minimise disturbance and limit damage to existing vegetation and soil.
- Implement intensive weed control activities in manageable-sized nodes where planting will be undertaken.
- Remove flower heads prior to seeding to limit reinforcement of the weed seed bank.
- In broadscale areas proposed for future works, or in high-risk areas of dense weeds with few native plants where complete removal is inappropriate, ensure either flower removal or repeated brushcutting occurs prior to seeding.

5.3 Planting out

- Ensure planted areas within streamlines are artificially stabilised and planted in low-flow conditions to enable sufficient time for establishment, to reduce the chance of plants being washed out during peak flows.
- Plant native species only in areas where weeds have been effectively controlled and managed for a preferred minimum of two seasons.
- Encourage landholders to ensure all strata of vegetation, including understorey, middlestorey and overstorey species are, over time, included in revegetation works to reinforce bank stability.
- Plant overstorey species initially in highly exposed regions lacking vegetation, to create a level of cover and protection for future plantings.
- Plant emergent and wetland plants in permanent water between September and March, securing those planted in flowing water with 600 mm steel "U" shaped pegs.

- Plant dryland plants in May to July and seasonally inundated areas in August to September.
- Plant in higher densities than ultimately required to create instant habitat and improve weed exclusion, particularly in the inner urban environments.
- Obtain professional advice about planting densities for each recommended species, to optimise chances of success and re-create a more natural ecosystem.

5.4 Maintenance

- Ensure the works program includes ongoing intensive maintenance of areas where weed control and planting works have previously been undertaken.
- Implement ongoing weed management, prior to commencing site preparation and planting works in new areas.
- Monitor for any natural regeneration on a regular basis, and undertake weed control around any emerging native plant seedlings.
- Assess the effectiveness of any river restoration works or installation of any products such as hemp matting, and modify as required.
- Determine the impact of vandalism, if any, and develop and implement strategies to manage this problem.

5.5 Monitoring

- Continue to use the proforma to assess changes and improvement to foreshore health over time.
- Assess the effectiveness and relative benefits of different management techniques utilised and update the works program accordingly.
- Document the results and learn from experience.
- Monitor the effectiveness of sustaining interest within the project at both the management and implementation level. Develop techniques to support community groups and individuals undertake this work.
- Minimise the potential for burnout by not over-extending limited resources, particularly labour.



6. Common issues

6.1 Ownership and access

It is essential that cadastral boundaries are determined at each site and that the people implementing the foreshore assessment are aware of who owns the land. Permission is required from the landowners, which may be State or local government authorities or private landholders, prior to undertaking any survey work. Gaining access to private property may prove to be difficult, while permission to enter most government managed lands is generally readily available.

Often property boundaries are fenced and landowners may be suspicious that any information collected during surveys along their foreshore will eventually be used against them. It is important that people implementing the survey are clear about the process and the reasons for the survey and approach the relevant landholders. Where landholder agreement cannot be readily obtained, it is important not to waste time and resources in excessive negotiations. Locate landholders that are interested in improving the health of their foreshore and assist them to enhance their land. Healthy foreshores can increase property values, and through discussion within communities, can ultimately result in peer pressure on others to protect their waterways.

There are often conflicting perceptions about the requirements for managing riparian zones and determining what is a healthy foreshore. Many landholders consider lawn to the high water mark with occasional trees to be healthy and providing sufficient habitat value. For example, large numbers of birds, e.g. black ducks, frequently using the foreshore, may be construed as evidence of adequate habitat. It is very difficult to articulate foreshore management issues until a common perception of a stable, intact waterway is developed between the group doing the work and the wider community.

A further conflict can arise when landholders consider that their current foreshore management program is adequate. For example, as well maintained lawns reduce the fire hazard, limit uncontrolled weed growth and keep the stream bed free of debris, it is claimed by these private landholders to be an appropriate management

technique to protect the waterway. Frequently this management regime is in contrast to management practices in neighbouring foreshore reserves that are managed by State and local government authorities. Extensive weeds, limited access and considerable fire risk are often features of these reserves. As a result it is perceived that there is little management effort. In situations where State and local government authorities are not demonstrating best management practice, it is difficult to discourage landholders from maintaining their own inappropriate management program.

Both State and local government and the wider community need to implement improved foreshore management.

6.2 Developing management and rehabilitation plans

Management plans are an important tool used to strike a balance between the multiple use demands of foreshore areas and the protection of flora, fauna and water quality. These plans should have clearly defined aims, objectives and visions as, ultimately, the use of the land will determine how, where and if, rehabilitation plans should be developed and implemented.

For example, if a grassed area occurs adjacent to a waterway which is a high-use recreation zone, then extensive revegetation works are likely to impinge on the purpose of the land and therefore may be inappropriate. A compromise position may need to be negotiated such as establishing a narrow buffer zone immediately along the stream banks, with well defined access points for viewing the waterway. The buffer zone needs to have a clearly defined boundary between any lawn areas and native vegetation to avoid trampling of native seedlings.

All issues associated with development, conservation and management of the waterway and associated land need to be addressed prior to the development of any plans. Community needs and visions for particular areas need to be canvassed to ensure that the plan reflects community attitudes, which will affect whether or not plans are implemented.



Following management planning, the next stage is to develop a rehabilitation plan for the whole waterway. It is essential to extend the assessment of foreshore condition to the full length of the waterway prior to any works, to gain a complete understanding of current health. This may be limited by access issues, however the more complete the understanding of the waterway and their tributaries, the better.

An ecosystem approach to management will ensure that appropriate rehabilitation plans are developed to minimise the impact of any activities. For example, complete eradication of dense weeds along the immediate foreshore results in acute loss of habitat and may destabilise foreshore banks, increasing the danger of severe erosion and bank collapse. It is necessary to undertake weed control in small, manageable-sized nodes to ensure that eradicated weeds are immediately replaced with deep-rooted native species, to minimise the impact on bank stability and protect native fauna.

Developing detailed management and rehabilitation plans and having a clear understanding of the works required over the long term, enables the development of detailed budgets, allocation of funding or the raising of funds to ensure the completion of any project.

6.3 Long term management

The rehabilitation planning process should include a maintenance schedule for existing works as well as future projects. The importance of continued maintenance on current project sites prior to beginning any new works is emphasised. Long term ongoing management must be scheduled to ensure the success of any rehabilitation works. Weed control needs to be continued indefinitely as there will always be the threat of reinfestation.

Undertaking works on Crown land and reserves requires ongoing community commitment and assistance from State and local government agencies with firebreak maintenance and provision of qualified herbicide operators to undertake weed control.

Private landowners must be strongly committed to any project undertaken on their property to ensure ongoing maintenance. Any change in ownership may require negotiation with the new owners to determine if management will continue.

Once a rehabilitation project has commenced on a property it will require a significant amount of time to implement weed control, planting and maintenance. Setting manageable areas for work and achievable targets is the most effective way to ensure success. Over-extension of limited resources frequently causes the areas to degrade further, resulting in a situation that is worse than prior to any rehabilitation effort.

There is nothing more disillusioning than having put considerable effort into developing and implementing works for little or no benefit in the medium to long term.

6.4 Surrounding landuse

Adjacent land use can have a considerable impact on the riparian zone and waterway health. Different land uses have different implications for stream health and therefore the appropriate management regimes will vary.

Riparian zones are often highly degraded. Foreshore vegetation is frequently reduced to a few metres either side of the watercourse. It is important to provide information to landholders and land managers about the benefits of undertaking remedial works along foreshores, emphasising the importance of fencing off riparian areas and excluding stock. Obtaining funds and providing support may encourage interested landholders to undertake intensive weed control and revegetation works.

Foreshores in urban areas are frequently high-use recreation sites. Traditionally, large open areas of maintained lawn were favoured over dense stands of native vegetation. Advertising campaigns and signage around project sites can increase community awareness. Providing detailed information on the benefits of replanting native species (such as stabilising foreshore banks and increasing stream cover and habitat diversity) will increase awareness and may encourage local residents to become involved in the projects.

Sedimentation of watercourses is generally an indication of erosion occurring further upstream. No system can be considered in total isolation, as there will always be impacts from activities further upstream. When undertaking any projects it is essential that groups have a clear understanding of the surrounding land use and the condition of any tributaries feeding into the main waterway.



The impact of new subdivisions or earthworks upstream should be carefully monitored. Weeds may invade from nearby residential housing. Subdivisions can also have a huge impact on water regimes and sediment loads entering streams and tributaries. Early detection of potential threats minimises the impact on foreshore health in the long term if remedial action is undertaken immediately. Diamentions

6.5 Gaining support from state and local government

State and local government have a significant role to play in supporting foreshore rehabilitation. Many agencies are directly involved in managing waterways and foreshore areas. The Water Corporation, the Water and Rivers Commission, the Swan River Trust, Agriculture WA and local government authorities all actively manage or help to manage some waterways within the State.

Many of these agencies have statutory requirements to meet, which relate to the management of these areas. The Swan River Trust management area, for example, comprises the bed and banks of the Swan and Canning Rivers extending across the riparian zone to the limit of the parks and recreation reservation. It is illegal to undertake any works within the Swan River Trust management area without notifying the Swan River Trust.

Some agencies also have community support functions to assist groups to undertake hands-on work and prepare management and rehabilitation plans, and can provide some support for administrative and information requirements.

Key contacts include:

Contact	Agency	Contact Number
Ecoplan	Department of Environmental Protection	9222 7000
	Swan Catchment Centre	9221 5300
	Water and Rivers Commission	9278 0300
	Swan River Trust	9278 0400
	Agriculture WA	9368 3333
	Relevant local government authority	White pages

There may be contacts within each agency for on-ground support. The Swan Catchment Centre has a Landcare

trailer that is fully rigged for landcare activities and provides equipment for site preparation, weed control and planting.

Where reserves are managed by a State or local government authority, it is essential that the community liaise with the land manager to develop and implement any assessment proforma and rehabilitation projects.

Support from agencies also improves the opportunities for gaining funding from external sources such as Greening Australia (WA), Lotteries WA and the Natural Heritage Trust.

6.7 Fire management

Fire is not recommended as a general management technique for riparian zones, particularly in the Scarp region and areas with peaty soils. Should fire occur as a result of arson or accident, then advantage should be taken of the increased access to the area for weed control.

Over burning is likely to significantly damage fringing vegetation, depleting the seed bank of some species, and may result in reduced bank stability and higher levels of erosion. Excess fire may encourage further weed invasion and the spread of existing weed species. Autumn burns are particularly risky.

Areas deemed to be at risk of fire should have a detailed fire management plan in place. This plan should detail actions required in the event of a fire, locations of water available for fire fighting and access routes for fire fighters to enter the area. This is especially important if foreshore areas have been fenced off to prevent stock access or unauthorised access, thus hindering fire services from entering the area. The fire management plan should be prepared in conjunction with representatives from the Fire and Emergency Services Association.

6.8 Notes on reclamation of salt affected land

Surface expressions of salinity can be due to a number of causes. In Western Australia much of the salinity can be attributed to the rising watertable bringing salt, stored in the soil profile, to the surface. One of the main reasons for the rise in watertable levels is the large scale removal of the native, deep-rooted perennial plants.

Areas affected by salinity are capable of being a productive resource. To facilitate the return of salt



affected land to a productive state, a number of factors need to be considered. These include desired land use (grazing, agroforestry, recreational etc.), current salinity levels, availability of financial and logistical resources and the identification of recharge/discharge areas.

Revegetation using appropriate salt tolerant native species is recommended for the amelioration of salt affected lands. Attention should also be paid to addressing the cause of the rising watertable. This may involve using revegetation techniques at the point of recharge, which is often in areas of permeable soils higher in the topography of the area. This is a priority in areas where clearing of the native vegetation has previously occurred. High water use plants can be used

lower in the topography, where over time they may aid in reducing the watertable levels.

Amelioration of salt affected lands within riparian zones is especially important, as the scalding associated with the surface expression of salinity leaves areas devoid of vegetative cover. The removal of the fringing vegetation exacerbates the problems of erosion and bank destabilisation, reduces the levels of stream cover and results in a loss of the habitat values of waterways.

The following salt tolerant species have been recommended following discussions with Agriculture WA and the University of Western Australia Agricultural Science section. The following table contains some of these.

Table 5: Some suggested salt tolerant species

BOTANICAL NAME	COMMON NAME	COMMENTS
Understorey species		
* <i>Paspalum vaginatum</i>	Saltwater couch tolerance.	Very high waterlogging tolerance, no drought. Needs summer moisture.
* <i>Thinopyrum elongatum</i>	Tall wheat grass	Moderate waterlogging tolerance, weed potential.
* <i>Trifolium michelianum</i>	Balansa clover	Weed potential.
* <i>Trifolium fragiferum</i>	Strawberry clover	High waterlogging tolerance. Best on summer moisture, weed potential.
<i>Halosarcia</i> spp.		Many species are very tolerant of waterlogging and salinity.
<i>Sarcocornia blackiana</i>		Combined salt and waterlogging tolerance is particularly high. Can tolerate periodic inundation.
<i>Sarcocornia quinqueflora</i> sub sp. <i>quinqueflora</i>	Glasswort, Samphire	Combined salt and waterlogging tolerance is particularly high. Can tolerate periodic inundation.
<i>Sporobolus virginicus</i>	Marine couch	Reports tolerance to 25-50 dS/m on alkaline duplex soils and wet sites.
Middlestorey species		
<i>Baumea juncea</i>	Bare Twigrush	Limited salt tolerance and prefers seasonally moist soils.
<i>Isolepis nodosa</i>	Nodding Club Rush	Very drought tolerant but not indigenous to the hills area.
<i>Schoenoplectus validus</i>	Lake Club Rush	Requires permanent waterlogging or shallow water.
<i>Atriplex</i> spp.	Saltbush spp.	Generally require well-drained sites, some salinity tolerance.
<i>Acacia cyclops</i>	Coastal wattle	Severe to extreme tolerance. Sensitive to waterlogging.
<i>Acacia saligna</i>	Golden wreath wattle	Variation in provenances. Very good tolerance for salt and some waterlogging.
<i>Melaleuca lateriflora</i>		
Overstorey species		
<i>Casuarina obesa</i>	Salt sheoak	
* <i>Eucalyptus halophila</i>	Salt lake mallee	
* <i>Eucalyptus platypus</i> var. <i>heterophylla</i>	Coastal moort	Could have very high salt tolerance.
<i>Eucalyptus rudis</i>	Flooded gum	
<i>Melaleuca cuticularis</i>	Saltwater paperbark	

NB: Asterix (*) denotes non-local Western Australian species



Before selecting species for revegetation programs, especially within the riparian zone, salinity levels should be determined and appropriate species, which are unlikely to become a weed species, should be selected. Selection of species should be made in conjunction with a Landcare, Agriculture WA or other authority on appropriate local species. Plants or seed should be sourced from within the local provenance, where possible.

6.9 Access to information

State and local government authorities have considerable information resources about waterways and should be contacted for assistance.

Existing information about any particular waterway should be collated prior to development of management plans.

General information about weed control techniques, site preparation and stream and foreshore restoration needs to be obtained prior to the development of rehabilitation plans.



7. Matters for Consideration

7.1 Liaison with government agencies

A number of recommendations cited throughout this report require substantial technical assistance or additional funds to implement. Consequently, it may be beyond the scope of many community groups to undertake these projects due to a lack of available resources. Further, in many instances approval from the appropriate authority is required before any works can progress. Liaison with government agencies at the local and State level is an important step in determining if these remedial strategies can be implemented. Therefore, even though these recommendations can often not be addressed immediately, they can become a focus for future works when funds and assistance become available.

7.1.2 Water and Rivers Commission and the Swan River Trust

The Water and Rivers Commission and the Swan River Trust play an integral role in the management and protection of our waterways. Many of the recommendations suggest that community groups liaise with these agencies to determine opportunities to investigate the following:

- Monitor stream health at a catchment level to assess erosion events, sediment loads, peak flow rates and pollution levels.
- Determine opportunities to retain water upslope when flow rates are high by increasing groundwater use through planting trees or to investigate the feasibility of diverting water flow into holding ponds.
- Assess the potential to minimise the amount of saline water entering waterways by installing upslope interception banks.
- Determine the legality of all off-take pipes, pumps and water containment structures (ponds and dams) located along waterways to investigate the level of water extraction.
- Assess the impact of dams and ponds on stream flow and sedimentation, ensuring that these structures meet

with stipulated conditions of construction and design and do not impact on stream hydrology or foreshore stability.

7.1.3 Local Government Authority

Community groups need to establish close links with their local government authorities when aiming to undertake any rehabilitation works on foreshore areas, as approval and support is required. It is important to understand the current policies and requirements of these authorities and to undertake works within a framework that complements their own aims for the management of these riparian areas.

Work with the local government authorities to:

- Review current structures that may be exacerbating erosion and address these problems using appropriate water sensitive urban design principles.
- Determine the possibility to construct where required, crossover points, drainage outfalls, rock spillways and riffle zones that promote the stabilisation of foreshore areas.
- Assess the provision of recreational facilities such as bins to limit rubbish entering the waterway.
- Provide guideways using bollards and woodchip pathways to minimise the trampling of vegetation, particularly near revegetation works or valuable remnant vegetation.
- Promote careful management of recreational parks, ensuring mowing and other maintenance work does not threaten native plants.
- Encourage the use of appropriate native species in any planting works associated with foreshore areas.
- Assess and limit access to areas if required.
- Install signage to inform the local community and promote care of the foreshore environment.
- Ensure that any prescribed burns are undertaken in a mosaic pattern to provide sufficient cover and habitat for fauna while the vegetation is regenerating.



7.1.4 Department of Environmental Protection

The primary responsibility of the Department of Environmental Protection is to monitor and protect the environment. This department will provide information to the community about numerous issues such as stating appropriate guidelines for development proposals, environmental protection and management rules, policy directions and will undertake assessment of reports of pollution or environmental damage.

Contact the Department of Environmental Protection to assess:

- Potential source points of nutrient or chemical pollutants entering the waterway from surrounding residential, business (such as petrol stations) or rural developments.

7.1.5 Ministry for Planning

The Ministry for Planning is the government agency responsible for landuse planning and therefore the community should liaise with this department (and the Department of Environmental Protection) to ensure:

- Any future subdivisions and residential developments close to foreshore areas have suitable management systems and infrastructure in place, to prevent degradation of the foreshore and stream environments.
- The use of water sensitive urban design principles to aid in decreasing potential water and sediment loads to waterways when developing drainage infrastructure close to waterways.

7.1.6 Main Roads Western Australia

Main Roads Western Australia manages the road and transport network and associated road reserves. Encourage Main Roads WA to:

- Install gross pollutant or sand/silt traps on stormwater system outfalls into waterways to collect rubbish and sediment.
- Maintain weed management in road reserves adjacent to riparian areas.

7.1.7 Department of Conservation and Land Management

The Department of Conservation and Land Management (CALM) is the State government agency that manages our national parks and reserves. Foreshore areas on reserve land are protected by legislation and managed by the department and therefore approval is required if community groups wish to undertake any works in these areas. CALM also provides a wide range of information and support to community groups. Contact the department to find out information about the:

- Western Shield Program to control feral animals.
- Detection and management of Jarrah dieback or other plant diseases.

7.1.8 Agriculture Western Australia (AGWEST)

Agriculture Western Australia has a great deal of information that is available to the community including pamphlets and publications on a range of landcare subjects. They also provide a number of services. Liaise with AGWEST to:

- Gain advice on the identification and control of pest insects.
- Assess salinity levels in salt affected areas and investigate mechanisms to contain saline runoff upslope, away from waterways to protect vegetation from the hypersaline waters.
- Determine if it is appropriate to establish perennial pastures associated with foreshore areas to provide an alternative to landholders that currently allow stock to freely graze these areas. Ensure that the management of such a cropping system prevents the plants from seeding, and that plant fragments are trapped to prevent these species from invading the riparian zone.



7.1.9 Fire & Emergency Services Authority of WA

It is essential that community groups ensure that appropriate fire management plans are developed for foreshore areas, as these sites are often in close proximity to high-density residential areas and may pose a threat to public safety. Community groups should liaise with the Fire & Emergency Services Authority of WA to ensure a comprehensive plan is maintained. It is important that all associated agencies such as the Department of Conservation and Land Management, the local volunteer fire brigade and the State Emergency Service are informed of any changes to access to sites. It is also important to ensure that firebreaks are maintained.

7.2 Further information

The world wide web can provide a wealth of information and useful contacts. Following are some URL addresses that may be of use:

The Government of Western Australia:

<http://www.wa.gov.au/>

Water and Rivers Commission:

<http://www.wrc.wa.gov.au/>

Swan River Trust:

<http://www.wrc.wa.gov.au/srt/index.htm>

Water Corporation:

<http://www.watercorporation.com.au/>

Department of Environmental Protection:

<http://www.environ.wa.gov.au/>

Main Roads WA:

<http://website.mrwa.wa.gov.au/>

Ministry for Planning:

<http://www.planning.wa.gov.au/index.html>

Department of Conservation and Land Management:

<http://www.calm.wa.gov.au/>

Agriculture Western Australia:

<http://www.agric.wa.gov.au/agency/index.htm>

Fire and Emergency Services Western Australia:

<http://www.fire.wa.gov.au/>

WA online: <http://www.onlinewa.com.au/enhanced/>



8. Summary

This document provides the results of the second series of foreshore assessments undertaken along selected sections within the Helena River catchment in accordance with the Shepherd and Siemon 1999; WRC Report RR2 foreshore condition assessment proforma. Testing and refining the assessment protocol in this work was intended to identify any shortcomings or limitations of the proforma.

The foreshore assessment process has been developed to aid interested community groups, officers of State and local government authorities and private landholders in urban and semi-rural areas to gain an understanding of the condition of foreshore areas within their own community. By using a standard methodology to gather information it is possible to compare and contrast the foreshore condition of the same area over time, or of different sites in the same survey season to prioritise works.

The key findings of the study showed that the health of the Helena River and its tributaries, rated in accordance with the Stream Condition Index ranged from Very Poor to Excellent. This was one of the few rivers surveyed that retained an area classified as Blue (Excellent). This occurred in the upper reaches of the catchment. This site will provide valuable information to community groups seeking to restore the sections of the river. It is critical that access to the site is managed carefully so the values of this area are not compromised.

The key areas on which rehabilitation work should focus are:

- improving culverts, drainage lines and spillways to enhance bank stability,
- working to protect and restore native vegetation,
- increasing stream cover by increasing the extent of fringing vegetation and re-aligning some debris instream to protect the banks,
- increasing habitat diversity and connectivity i.e. corridors, and
- encouraging private landholders to protect and improve their waterways by linking it with land values, improved ability to farm or utilise the land to earn a living and selling the aesthetic appeal of native bushland.

Managing access for fire management and recreation is a critical component, particularly in the upper reaches.

Many of the issues require all landholders and the wider community to work collectively in order to make a difference. The importance of catchment groups in raising awareness, providing technical and on-ground support and encouraging all landholders to become involved, cannot be stressed enough.

This report of foreshore condition will be one of many, as the process continues to evolve and be implemented across urban and semi-rural areas Statewide.



9. References and recommended reading

- APACE Green Skills and Pen, L. J. (1997), *Survey of river foreshores in the Oyster Harbour Catchment*. Water and Rivers Commission Report, Water Resource Technical Series No. 17, Western Australia.
- Bush, B., Maryan, B., Browne-Cooper, R. and Robinson, D. (1995), *A guide to the reptiles and frogs of the Perth region*. University of Western Australia Press, Nedlands, Western Australia.
- Hussey, B. M. J., Hobbs, R. J. and Saunders, D.A. (1989), *Guidelines for bush corridors*. Surrey Beatty & Sons, Sydney.
- Hussey, B. M. J., and Wallace, K. J. (1993), *Managing your bushland*. Department of Conservation and Land Management, Western Australia.
- Land and Water Resources Research and Development Corporation (1996), *Managing riparian land*. Riparian Management Series (1), September 1996.
- Land and Water Resources Research and Development Corporation (1996), *Water quality*. Riparian Management Series (3), November 1996.
- Land and Water Resources Research and Development Corporation (1996), *River ecosystems*. Riparian Management Series (4), November 1996.
- Land and Water Resources Research and Development Corporation (1996), *Land-based ecosystems*. Riparian Management Series (5), November 1996.
- Land and Water Resources Research and Development Corporation (1998), *Managing snags in rivers*. Riparian Management Series (7), February 1998.
- Pen, L. J. (1992), *Fringing vegetation of the Lower Collie and Brunswick River 1992*. Leschenault Management Authority, Waterways Commission Report No. 37, Western Australia.
- Pen, L. J. (1993), *Fringing vegetation of the Canning, Southern and Wungong Rivers*. Swan River Trust Report No. 7, Western Australia.
- Pen, L. J. (1994), *Condition of the foreshore vegetation of the Kalgan River 1992*. Albany Waterways Management Authority, Waterways Commission Report, Western Australia.
- Pen, L. J. and Majer, K. (1993), *Living streams – a guide to bringing watercourses back to life in south-west Western Australia*. Waterways Commission Perth, Western Australia.
- Pen, L. J. and Scott, M. (1999), *Stream foreshore assessment in farming areas*. Blackwood Catchment Coordinating Group, Western Australia.
- Pen, L. J. (1999), *Managing our rivers. A guide to the nature and management of the streams of south-west Western Australia*. Water and Rivers Commission, Natural Heritage Trust, Western Australia.
- Riding, T. and Carter, R. (1992), *The importance of the riparian zone in water resource management*. Water Resources, Canberra.
- Scheltema, M. and Harris, J. (Eds) (1996), *Managing Perth's bushland*. Greening WA, Western Australia.
- Siemon, N. (1994) *Lower Canning River Management Plan*. Swan River Trust, Report No 23, Western Australia.
- Siemon, N., Davis, G., Hubbard, P. and Duckworth, A. (1993), *Fringing vegetation of the Serpentine River in the Shire of Serpentine-Jarrahdale and City of Rockingham*. Waterways Commission Report No. 38, Western Australia.
- Water and Rivers Commission (1999), *Planning and Management; Foreshore condition assessment in urban and semi-rural areas of south-west Western Australia*. Water and Rivers Commission, River Restoration Report RR 2, Western Australia.
- Water and Rivers Commission (1999), *Planning and Management; Foreshore Condition Assessment in farming areas of south-west Western Australia*. Water and Rivers Commission, River Restoration Report RR 3, Perth, Western Australia.



- Water and Rivers Commission (1999), *Revegetation; Revegetating riparian zones in south-west Western Australia*. Water and Rivers Commission, River Restoration Report RR 4, Western Australia.
- Water and Rivers Commission (1999), *Revegetation; Case studies from south-west Western Australia*. Water and Rivers Commission, River Restoration Report RR 5, Western Australia.
- Water and Rivers Commission (1999), *Testing a protocol for foreshore assessment in metropolitan waterways*. Water and Rivers Commission, Report No. WRM 13, Western Australia.
- Water and Rivers Commission (1998), *Water words*. Water and Rivers Commission, Water facts 1, Western Australia.
- Water and Rivers Commission (1996), *Macro-invertebrates and water quality*. Water and Rivers Commission, Water facts 2, Western Australia.
- Water and Rivers Commission (1997), *River and estuary pollution*. Water and Rivers Commission, Water facts 3, Western Australia.
- Water and Rivers Commission (1998), *Living streams*. Water and Rivers Commission, Water facts 4, Western Australia.
- Water and Rivers Commission (1998), *Taking water from streams and lakes*. Water and Rivers Commission, Water facts 5, Western Australia.
- Water and Rivers Commission (2000), *Wetlands and weeds*. Water and Rivers Commission, Water note WN1, Western Australia.
- Water and Rivers Commission (2000), *Wetlands and fire*. Water and Rivers Commission, Water note WN2, Western Australia.
- Water and Rivers Commission (2000), *Wetland vegetation*. Water and Rivers Commission, Water note WN3, Western Australia.
- Water and Rivers Commission (2000), *Wetland buffers*. Water and Rivers Commission, Water note WN4, Western Australia.
- Water and Rivers Commission (2000), *Wetlands and waterbirds*. Water and Rivers Commission, Water note WN5, Western Australia.
- Water and Rivers Commission (2000), *Livestock management: Construction of livestock crossings*. Water and Rivers Commission, Water note WN6, Western Australia.
- Water and Rivers Commission (2000), *Livestock management: Watering points and pumps*. Water and Rivers Commission, Water note WN7, Western Australia.
- Water and Rivers Commission (2000), *Habitat of rivers and creeks*. Water and Rivers Commission, Water note WN8, Western Australia.
- Water and Rivers Commission (2000), *The value of large woody debris (snags)*. Water and Rivers Commission, Water note WN9, Western Australia.
- Water and Rivers Commission (2000), *Protecting riparian vegetation*. Water and Rivers Commission, Water note WN10, Western Australia.
- Water and Rivers Commission (2000), *Identifying the riparian zone*. Water and Rivers Commission, Water note WN11, Western Australia.
- Water and Rivers Commission (2000), *The values of the riparian zone*. Water and Rivers Commission, Water note WN12, Western Australia.
- Water and Rivers Commission (2000), *The management and replacement of large woody debris in waterways*. Water and Rivers Commission, Water note WN13, Western Australia.
- Water and Rivers Commission (2000), *Lamprey guides*. Water and Rivers Commission, Water note WN14, Western Australia.
- Water and Rivers Commission (2000), *Weeds in waterways*. Water and Rivers Commission, Water note WN15, Western Australia.
- Water and Rivers Commission (2000), *River and estuary appreciation and protection*. Water and Rivers Commission, Water note WN16, Western Australia.
- Water and Rivers Commission (2000), *Sediment in streams*. Water and Rivers Commission, Water note WN17, Western Australia.
- Water and Rivers Commission (2000), *Livestock management: fence location and grazing control*. Water and Rivers Commission, Water note WN18, Western Australia.



Water and Rivers Commission (2000), *Flood proofing fencing for waterways*. Water and Rivers Commission, Water note WN19, Western Australia.

Water and Rivers Commission (2000), *Rushes and sedges*. Water and Rivers Commission, Water note WN20, Western Australia.

Water and Rivers Commission (2000), *Importance of large woody debris in sandy bed streams*. Water and Rivers Commission, Water note WN21, Western Australia.

Woodcock, S. (1994), *Collie and Brunswick Rivers foreshore study*. Leschenault Inlet Management Authority, Waterways Commission, Report No. 48, Western Australia.



Appendix 1

Native species identified
during the foreshore assessment –
Stage 2



Appendix 1a: Native species identified during the foreshore assessment process (1999)

Scientific name	Common Name	Jane Brook	Blackadder-Woodbridge Creeks	Helena River	Wooroloo Brook
<i>Acacia alata</i>	Winged Wattle				
<i>Acacia pulchella</i>	Prickly Moses				
<i>Acacia saligna</i>	Coojong				
<i>Acacia</i> sp.					
<i>Acacia teretifolia</i>					
<i>Agonis flexuosa</i>	WA Peppermint				
<i>Agonis linearifolia</i>	Swamp Peppermint				
<i>Alexgeorgea arenicola</i>					
<i>Allocasuarina fraseriana</i>	Sheoak				
<i>Allocasuarina humilis</i>	Dwarf Sheoak				
<i>Andersonia aristata</i>	Rice Flower				
<i>Andersonia lehmanniana</i>					
<i>Anigozanthos</i> sp.	Kangaroo Paw				
<i>Astartea fascicularis</i>	Common Astartea				
<i>Astroloma ciliatum</i>	Moss-Leaved Heath				
<i>Astroloma foliosum</i>	Candle Cranberry				
<i>Astroloma pallidum</i>	Kick Bush				
<i>Azolla</i> sp.					
<i>Baeckea camphorosmae</i>	Camphor Myrtle				
<i>Banksia littoralis</i>	Swamp Banksia				
<i>Baumea articulata</i>	Jointed Twig Rush				
<i>Baumea juncea</i>	Bare Twigrush				
<i>Baumea rubiginosa</i>	River Twigrush				
<i>Baumea</i> sp.					
<i>Borya sphaerocephala</i>	Pincushions				
<i>Borya</i> sp.					
<i>Bossiaea aquifolium</i>	Water Bush				
<i>Bossiaea</i> sp.					
<i>Caladenia</i> spp.	Orchids				
<i>Callistemon</i> sp.					
<i>Calothamnus quadrifidus</i>	One Sided Bottlebrush				
<i>Calothamnus sanguineus</i>	Pindak				
<i>Calytrix variabilis</i>	Star Flowers				
<i>Carex appressa</i>	Tall Sedge				
<i>Carex fascicularis</i>	Tassel Sedge				
<i>Carex</i> sp.					
<i>Cassytha flava</i>	Dodder Laurel				



Scientific name	Common Name	Jane Brook	Blackadder- Woodbridge Creeks	Helena River	Wooroloo Brook
<i>Cassytha</i> sp.					
<i>Casuarina obesa</i>	Swamp Sheoak				
<i>Centella cordifolia</i>	Centella				
<i>Centrolepis</i> sp.	Centrolepis				
<i>Cheilanthes austrotenuifolia</i>	Rock Fern				
<i>Cheilanthes distans</i>	Bristly Cloak Fern				
<i>Chenopodium glaucum</i>	Glaucous Goosefoot				
<i>Clematis microphylla</i>	Old Mans Beard				
<i>Clematis pubescens</i>	Common Clematis				
<i>Conostylis setigera</i>	Bristly Conostylis				
<i>Conostylis setosa</i>	White Cottonhead				
<i>Conostylis</i> sp.					
<i>Convolvulus erubescens</i>	Pink Bindweed				
<i>Corymbia calophylla</i>	Marri				
<i>Corynotheca micrantha</i>	Sand Lily				
<i>Cryptandra arbutiflora</i>	Waxy Cryptandra				
<i>Dampiera alata</i>	Winged stem Dampiera				
<i>Darwinia citriodora</i>	Lemon Scented Darwinia				
<i>Darwinia thymoides</i>					
<i>Daviesia decurrens</i>	Prickly Bitter Pea				
<i>Daviesia horrida</i>					
<i>Daviesia preissii</i>					
<i>Dianella revoluta</i>	Spreading Flax Lily				
<i>Dianella</i> sp.					
<i>Dillwynia</i> sp.					
<i>Drosera glanduligera</i>	Pimpernel Sundew				
<i>Drosera macrantha</i>	Climbing Drosera				
<i>Drosera microphylla</i>	Purple Rainbow				
<i>Drosera pallida</i>	Pale Rainbow				
<i>Dryandra armata</i>	Prickly Dryandra				
<i>Dryandra bipinnatifida</i>					
<i>Dryandra nivea</i>	Couch Honeypots				
<i>Dryandra sessilis</i>	Parrot Bush				
<i>Eucalyptus laeliae</i>	Darling Range Ghost Gum				
<i>Eucalyptus marginata</i>	Jarra				
<i>Eucalyptus patens</i>	Black Butt				
<i>Eucalyptus rudis</i>	Flooded Gum				
<i>Eucalyptus wandoo</i>	Wandoo				



Scientific name	Common Name	Jane Brook	Blackadder- Woodbridge Creeks	Helena River	Wooroloo Brook
<i>Gompholobium tomentosum</i>	Hairy Yellow Pea				
<i>Goodenia fasciculata</i>					
<i>Grevillea bipinnatifida</i>	Native Fuchsia				
<i>Grevillea diversifolia</i>	Variable Leaf Grevillea				
<i>Grevillea endlicheriana</i>	Spindly Grevillea				
<i>Grevillea glabrata</i>	Smooth Grevillea				
<i>Grevillea pilulifera</i>	Woolly Grevillea				
<i>Grevillea quercifolia</i>	Oak-leaved Grevillea				
<i>Grevillea</i> sp.					
<i>Grevillea synapheae</i>	Catkin Grevillea				
<i>Grevillea wilsonii</i>	Wilson's Grevillea				
<i>Haemodorum</i> sp.	Mene				
<i>Hakea amplexicaulis</i>	Prickly Hakea				
<i>Hakea cristata</i>	Snail Hakea				
<i>Hakea erinacea</i>	Hedge-hog Hakea				
<i>Hakea lissocarpa</i>	Honeybush				
<i>Hakea petiolaris</i>	Sea-Urchin Hakea				
<i>Hakea prostrata</i>	Harsh Hakea				
<i>Hakea ruscifolia</i>	Candle Hakea				
<i>Hakea trifurcata</i>	Two-Leaved Hakea				
<i>Hakea undulata</i>	Wavy-Leafed Hakea				
<i>Hakea varia</i>	Variable Leaf Hakea				
<i>Hardenbergia comptoniana</i>	Native Wisteria				
<i>Hemiandra pungens</i>	Snake Bush				
<i>Hemiandra sericea</i>					
<i>Hibbertia spicata</i>					
<i>Hibbertia hypericoides</i>	Yellow Buttercup				
<i>Hibbertia</i> sp.	Native Buttercups				
<i>Hibbertia subvaginata</i>					
<i>Hovea chorizemifolia</i>	Holly-leaved Hovea				
<i>Hovea pungens</i>	Devils Pins				
<i>Hovea trisperma</i>	Common Hovea				
<i>Hybanthus floribundus</i>					
<i>Hypocalymma angustifolium</i>	White Myrtle				
<i>Hypocalymma robustum</i>	Swan River Myrtle				
<i>Hypolaena</i> sp.					
<i>Isolepis nodosa</i>	Knotted Club Rush				
<i>Isolepis setiformis</i>	Tufted Sedge				
<i>Isolepis</i> sp.	Club Rushes				
<i>Isopogon sphaerocephalus</i>	Drum Stick Isopogon				



Scientific name	Common Name	Jane Brook	Blackadder-Woodbridge Creeks	Helena River	Wooroloo Brook
<i>Jacksonia furcellata</i>	Grey Stinkwood				
<i>Jacksonia sternbergiana</i>	Green Stinkwood				
<i>Juncus holoschoenus</i>	Jointed Rush				
<i>Juncus kraussii</i>	Shore Rush				
<i>Juncus pallidus</i>	Pale Rush				
<i>Juncus</i> sp.					
<i>Kennedia prostrata</i>	Running Postman				
<i>Kennedia stirlingii</i>	Bushy Kennedia				
<i>Kunzea</i> sp.					
<i>Labichea lanceolata</i>	Tall Labichea				
<i>Labichea punctata</i>	Lance Leaved Cassia				
<i>Lasiopetalum bracteatum</i>	Helena Velvet Bush				
<i>Lasiopetalum</i> sp.					
<i>Laxmannia squarrosa</i>					
<i>Lechenaultia biloba</i>	Blue Lechenaultia				
<i>Lepidosperma angustatum</i>					
<i>Lepidosperma effusum</i>	Spreading Sword Sedge				
<i>Lepidosperma longitudinale</i>	Pithy Sword Sedge				
<i>Lepidosperma scabrum</i>					
<i>Lepidosperma</i> sp.					
<i>Lepidosperma tetraquetrum</i>	Angle Sword Sedge				
<i>Leptospermum ellipticum</i>	Tea Tree				
<i>Leucopogon</i> sp.	Bearded Heath				
<i>Leucopogon verticillatus</i>	Tassel Flower				
<i>Lomandra odora</i>	Tiered Mat Rush				
<i>Lomandra preissii</i>					
<i>Macrozamia riedlei</i>	Zamia				
<i>Melaleuca cuticularis</i>	Salt Water Paperbark				
<i>Melaleuca lateritia</i>	Robin Redbreast Bush				
<i>Melaleuca preissiana</i>	Modong				
<i>Melaleuca raphiophylla</i>	Swamp Paperbark				
<i>Melaleuca scabra</i>	Rough Honey Myrtle				
<i>Melaleuca viminea</i>	Mohan				
<i>Mesomelaena preissii</i>					
<i>Mesomelaena pseudostygia</i>					
<i>Mesomelaena stygia</i>					
<i>Mesomelaena tetragona</i>	Semaphore Sedge				
<i>Notodanthonia</i> sp.					
<i>Nuytsia floribunda</i>	WA Christmas Tree				



Scientific name	Common Name	Jane Brook	Blackadder- Woodbridge Creeks	Helena River	Wooroloo Brook
<i>Oxylobium lineare</i>	Narrow-leaved Oxylobium				
<i>Paraserianthes lophantha</i>	Albizia				
<i>Patersonia occidentalis</i>	Purple Flag				
<i>Patersonia umbrosa</i>	Shade Patersonia				
<i>Pentapeltis peltigera</i>					
<i>Pericalymma ellipticum</i>	Swamp Teatree				
<i>Petrophile stricta</i>					
<i>Pimelea ciliata</i>	White Banjine				
<i>Pimelea spectabilis</i>	Banjine				
<i>Pimelea suaveolens</i>	Scented Banjine				
<i>Pronaya fraseri</i>	Elegant Pronaya				
<i>Pteridium esculentum</i>	Bracken Fern				
<i>Ptilonotus esquamatus</i>					
<i>Ptilonotus manglesii</i>	Mulla Mulla				
<i>Regelia ciliata</i>					
<i>Restio</i> sp.					
<i>Rulingia cygnorum</i>					
<i>Schoenoplectus validus</i>	Lake Club Rush				
<i>Schoenus grandiflorus</i>	Large Flowered Rush				
<i>Schoenus</i> sp.					
<i>Stirlingia latifolia</i>	Blueboy				
<i>Stylidium</i> sp.					
<i>Styphelia tenuiflora</i>	Common Pinheath				
<i>Synaphea petiolaris</i>	Granite Synaphea				
<i>Templetonia biloba</i>					
<i>Themeda australis</i>	Kangaroo Grass				
<i>Thomasia foliosa</i>					
<i>Thomasia macrocarpa</i>	Large Fruited Macrocarpa				
<i>Tricoryne elatior</i>	Yellow Autumn Lily				
<i>Triglochin procera</i>	Arrowgrass				
<i>Trymalium ledifolium</i>					
<i>Typha domingensis</i>	Bulrush				
<i>Verticordia huegelii</i>	Variegated Feather Flower				
<i>Verticordia</i> sp.	Feather Flowers				
<i>Viminaria juncea</i>	Swishbush				
<i>Xanthorrhoea gracilis</i>	Slender Grass Tree				
<i>Xanthorrhoea preissii</i>	Grass Tree				



Appendix 1b: Weed species identified during the foreshore assessment process (1999)

Scientific name	Common Name	Jane Brook	Helena River	Wooroloo Brook	Blackadder-Woodbridge Creeks
<i>Acacia</i> spp	Introduced Wattles				
<i>Alocasia brisbanensis</i>	Elephant Ear				
<i>Alternanthera</i> sp.	Joyweed				
<i>Aponogeton elongatus</i>					
<i>Arundo donax</i>	Giant Reed				
<i>Asparagus asparagoides</i>	Bridal Creeper				
<i>Aster subulatus</i>	Bushy Starwort				
<i>Avena fatua</i>	Wild Oats				
<i>Briza maxima</i>	Blowfly Grass				
<i>Briza minor</i>	Shivery Grass				
<i>Carex divisa</i>	Divided Sedge				
<i>Centaurea</i> spp.	Thistles				
<i>Chenopodium album</i>	Fat Hen				
<i>Conyza</i> spp	Fleabane				
<i>Cortaderia selloana</i>	Pampas Grass				
<i>Cynodon dactylon</i>	Couch Grass				
<i>Cyperus</i> spp.					
<i>Cytisus proliferus</i>	Tagasaste				
<i>Echium plantagineum</i>	Patersons Curse				
<i>Eragrostis curvula</i>	African Lovegrass				
<i>Ficus carica</i>	Edible Fig Tree				
<i>Foeniculum vulgare</i>	Fennel				
<i>Freesia aff. leichtlinii</i>	Freesia				
<i>Fumaria capreolata</i>	Whiteflower Fumitory				
<i>Gladiolus</i> sp.	Gladiolus				
<i>Gomphocarpus fruticosus</i>	Cotton Bush				
<i>Hedra helix</i>	Ivy				
<i>Hypochaeris radicata</i>	Flatweed				
<i>Ipomoea</i> sp.	Morning Glory				
<i>Juncus acutus</i>	Spiny Rush				
<i>Juncus microcephalus</i>					
<i>Lolium</i> sp.	Ryegrass				
<i>Lupinus angustifolia</i>	Lupins				
<i>Mentha pulegium</i>	Pennyroyal				
<i>Olea europaea</i>	Olive Tree				
<i>Opuntia</i> sp.	Prickly Pear				
<i>Oxalis pes-caprae</i>	Soursob				
<i>Oxalis glabra</i>					



Scientific name	Common Name	Jane Brook	Helena River	Wooroloo Brook	Blackadder-Woodbridge Creeks
<i>Oxalis purpurea</i>	Purple Wood Sorrel				
<i>Paspalum</i> spp.	Paspalum				
<i>Pennisetum clandestinum</i>	Kikuyu				
<i>Pennisetum setaceum</i>	Fountain Grass				
<i>Phalaris</i> spp.	Phalaris				
<i>Phytolacca octandra</i>	Inkweed				
<i>Pinus radiata</i>	Radiata Pine				
<i>Plantago lanceolata</i>	Ribwort Plantain				
<i>Populus</i> sp	Poplars				
<i>Quercus</i> sp.	Oak Tree				
<i>Raphanus raphanistrum</i>	Wild Radish				
<i>Rhynchelytrum repens</i>	Red Natal Grass				
<i>Ricinus communis</i>	Castor Oil				
<i>Romulea rosea</i>	Guildford Grass				
<i>Rosa</i> sp.	Rose				
<i>Rubus fruticosus</i>	Blackberry				
<i>Rumex</i> spp.	Dock				
<i>Salix</i> sp	Willows				
<i>Schinus terebinthifolia</i>	Japanese Pepper				
<i>Solanum nigrum</i>	Deadly Nightshade				
<i>Stenotaphrum secundatum</i>	Buffalo Grass				
<i>Trifolium</i> sp.	Clover				
<i>Typha orientalis</i>	Bulrush				
<i>Vicia sativa</i>	Vetch				
<i>Watsonia bulbifera</i>	Watsonia				
<i>Zantedeschia aethiopica</i>	Arum Lily				



Appendix 2

Suggested weed control methods



Appendix 2: Suggested weed control methods

Some of the information contained in this report has been taken from Dixon and Keighery (1995) in *Managing Perth's Bushlands* or referenced to Kings Park Board.

Species Name:	Acacia spp	Control Priority	Location	Habit	Form
Common Name:	Weed wattles	2	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input checked="" type="checkbox"/>
Seed Form:	Light seed		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input checked="" type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Species dependent - prior to flowering				Grass <input type="checkbox"/>
Method of Control:	Hand weed juvenile plants. Small plants means they are relatively easy to remove. Once plants are mature or woody stemmed, cut the main trunk/stem below the widest part of the stem beneath the ground. This will effectively kill all wattles.				
Species Name:	Allium triquetrum	Control Priority	Location	Habit	Form
Common Name:	Three cornered garlic	3	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input checked="" type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:			Riparian <input checked="" type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads by bulb or corm growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:					Grass <input type="checkbox"/>
Method of Control:	Apply Glyphosate 1 in 50 or Glean whilst plants are in flower. Repeat applications will be necessary.				
Species Name:	Alopecurus myosuroides	Control Priority	Location	Habit	Form
Common Name:	Slender foxtail	3	Dryland <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:			Riparian <input checked="" type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:					Rush/Sedge <input type="checkbox"/>
Best Time of Control:					Grass <input checked="" type="checkbox"/>
Method of Control:	Hand weeding prior to seeding is effective. Herbicides are not recommended as this plant occurs in wetlands and there is a threat of contamination.				
	Repeated brushcutting prior to seeding is effective and reduces the rate of spread of this plant.				

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

Ecosystem Management Services 1999



Species Name:	<i>Alternanthera nodiflora</i>	Control Priority	Location	Habit	Form
Common Name:	Joyweed	<input type="checkbox"/> 1	Dryland <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	March-April		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads from both seed and vegetative growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Oct-Nov				Grass <input type="checkbox"/>
Method of Control:	Hand weed plants in strips up to 2 m perpendicular to water flow and replace immediately with native emergent species. Carefully bag and remove weed material from the site.				
	Any segment which is broken from this plant is likely to regenerate into a new plant, so using a floating bund with netting or similar device downstream to trap any segments missed.				

Species Name:	<i>Anagallis arvensis</i>	Control Priority	Location	Habit	Form
Common Name:	Pimpernel	<input type="checkbox"/> 3	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:					Rush/Sedge <input type="checkbox"/>
Best Time of Control:					Grass <input type="checkbox"/>
Method of Control:	Hand weeding small populations is effective. Alternatively treat with Glyphosate or Glean at 15g per ha.				

Species Name:	<i>Aponogeton elongatus</i>	Control Priority	Location	Habit	Form
Common Name:		<input type="checkbox"/> 2	Dryland <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input checked="" type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads from both seed and vegetative growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Nov - Mar (access dependent)				Grass <input type="checkbox"/>
Method of Control:	This aquatic weed is difficult to control because it slows water movement, increases sedimentation and reduces erosion which affects bed and bank stability following removal. The recommended removal technique involves manual clearing of a channel and also clearing 5 to 10 m wide bands, 20 metres apart which are perpendicular to the stream flow. This will minimise the potential for de-stabilising the stream bed.				
	Seek expert advice and approvals from the relevant government agencies prior to implementing broad scale works. Herbicides should not be used for this weed. Shading out and planting dense clumps of indigenous plants are the most effective management techniques.				

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

Ecosystem Management Services 1999



Species Name:	Arctotheca calendula	Control Priority	Location	Habit	Form
Common Name:	Capeweed	3	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Coarse seed		Riparian <input type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Oct - Feb				Grass <input type="checkbox"/>
Method of Control:	Hand weeding small populations of this plant is effective. Rotary hoeing broadscale infestations repeatedly can also work. Kings Park Board recommends glyphosate at 100ml in 15l water. Lontrel 1 in 100 has been successful on larger plants in areas without any native vegetation.				

Species Name:	Arundo donax	Control Priority	Location	Habit	Form
Common Name:	Giant reed	2	Dryland <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Sept - Dec		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads readily from rhizome growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	All year				Grass <input checked="" type="checkbox"/>
Method of Control:	Cut down and spray regrowth when 0.5 - 1.0m high with Glyphosate 360 100ml in 10l of water. An alternative technique is to remove bulk of plant material and pour herbicide down each tube.				
	Ensure removal of seed heads prior to ripening if plant control is not possible. Generally this plant occurs on the banks of streams and rivers. It is important not to dig this plant out if there is a risk of increasing erosion. Onsite poisoning is the preferred option leaving the dense rhizome mat intact.				

Species Name:	Aster subulatus	Control Priority	Location	Habit	Form
Common Name:	Bushy starwort	3	Dryland <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light and easily spread by wind		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Aug - Mar				Grass <input type="checkbox"/>
Method of Control:	Hand weeding these plants is easy and effective. It is essential to weed them prior to flowering and fruiting to reduce their spread.				

Species Name:	Avena spp.	Control Priority	Location	Habit	Form
Common Name:	Wild Oats	2	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light, easily spread by wind		Riparian <input type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	March - June		Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Aug - Oct				Grass <input checked="" type="checkbox"/>
Method of Control:	Hand weeding small plants in winter is effective for small populations. Blanket/Spot spraying at 2l Fusillade per ha is effective. Brushcutting plants with immature seed heads will aid control in the longer term by minimizing seed spread.				
	Dense populations represent a significant fire hazard and threat to remnant vegetation, so repeated brushcutting also assists in reduction of fire hazard.				

Control priority 1 - Major environmental weed, urgent control required
 Control priority 2 - Nuisance weed, control as soon as possible
 Control priority 3 - Minor weed, control as resources become available



Species Name:	<i>Briza maxima</i>	Control Priority:	Location	Habit	Form
Common Name:	Blowfly grass	<input type="checkbox"/> 2	Dryland <input checked="" type="checkbox"/> Riparian <input type="checkbox"/> Aquatic <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/> Perennial <input type="checkbox"/> Annual <input checked="" type="checkbox"/>	Tree <input type="checkbox"/> Shrub <input type="checkbox"/> Herb <input type="checkbox"/> Rush/Sedge <input type="checkbox"/> Grass <input checked="" type="checkbox"/> Climber <input type="checkbox"/>
Seed Form:	Light, easily spread by wind				
Seeding Time:	Sept - Nov				
Method of Spread:	Spreads mostly from seed				
Best Time of Control:	June - Aug				
Method of Control:	Hand weeding is effective.				
	Control may be achieved by spot/blanket spraying Sertin or similar at 2l per ha.				

Species Name:	<i>Briza minor</i>	Control Priority:	Location	Habit	Form
Common Name:	Shivery grass	<input type="checkbox"/> 2	Dryland <input checked="" type="checkbox"/> Riparian <input type="checkbox"/> Aquatic <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/> Perennial <input type="checkbox"/> Annual <input checked="" type="checkbox"/>	Tree <input type="checkbox"/> Shrub <input type="checkbox"/> Herb <input type="checkbox"/> Rush/Sedge <input type="checkbox"/> Grass <input checked="" type="checkbox"/> Climber <input type="checkbox"/>
Seed Form:	Light, easily spread by wind				
Seeding Time:	Sept - Oct				
Method of Spread:	Spreads mostly from seed				
Best Time of Control:	June - Aug				
Method of Control:	Hand weeding is effective.				
	Control may be achieved by spot/blanket spraying Sertin or similar at 2l per ha.				

Species Name:	<i>Bromus diandrus</i>	Control Priority:	Location	Habit	Form
Common Name:	Great brome	<input type="checkbox"/> 2	Dryland <input checked="" type="checkbox"/> Riparian <input type="checkbox"/> Aquatic <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/> Perennial <input type="checkbox"/> Annual <input checked="" type="checkbox"/>	Tree <input type="checkbox"/> Shrub <input type="checkbox"/> Herb <input type="checkbox"/> Rush/Sedge <input type="checkbox"/> Grass <input checked="" type="checkbox"/> Climber <input type="checkbox"/>
Seed Form:	Coarse seed				
Seeding Time:	Sept - Nov				
Method of Spread:	Spreads mostly from seed				
Best Time of Control:	June - Aug				
Method of Control:	Hand weeding is easy and effective for small populations. The most frequently recommended treatment is Fusilade at between 2-4l per ha, when the plants are actively growing in winter. Repeated brushcutting can also be effective.				
	Note: Correct identification of grasses is important to protect native grasses from removal. The presence of native grasses should be investigated prior to spraying herbicides.				

Species Name:	<i>Canna spp.</i>	Control Priority:	Location	Habit	Form
Common Name:	Canna	<input type="checkbox"/> 3	Dryland <input type="checkbox"/> Riparian <input checked="" type="checkbox"/> Aquatic <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Annual <input type="checkbox"/>	Tree <input type="checkbox"/> Shrub <input type="checkbox"/> Herb <input checked="" type="checkbox"/> Rush/Sedge <input type="checkbox"/> Grass <input type="checkbox"/> Climber <input type="checkbox"/>
Seed Form:	Heavy seed				
Seeding Time:					
Method of Spread:	Spreads readily from rhizome growth				
Best Time of Control:	Sept - Apr				
Method of Control:	Dig out small infestations. Selectively spraying the leaves with a systemic herbicide can be effective.				
	Encourage residents to harvest the flowers to reduce seed production.				
	Broadscale removal of dense stands may threaten bank stability. Remove in nodes perpendicular to the water course or remove the bulk of biomass then treat with herbicide. Ensure the dense rhizome mat intact.				

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

Ecosystem Management Services 1999



Species Name:	<i>Cortaderia seloana</i>	Control Priority	Location	Habit	Form
Common Name:	Pampas Grass	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light and easily spread by wind		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Dec - Feb		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Sept - Nov				Grass <input checked="" type="checkbox"/>
Method of Control:	Cut plumes before seed ripens to limit spread. Remove most leaf material with a heavy duty brushcutter and paint regrowth with Glyphosate 1 in 2. Thoroughly wet both sides of the leaf.				
	In riparian situations do not attempt to dig out these plants, due to the potential to affect bank stability. Should fire occur in a riparian zone, then treat the plants as soon as they reshoot to take advantage of easy access.				

Species Name:	<i>Cynodon dactylon</i>	Control Priority	Location	Habit	Form
Common Name:	Couch	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	May, April		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads readily from rhizome growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Oct - Feb and April - May				Grass <input checked="" type="checkbox"/>
Method of Control:	Hand weeding is very difficult, labour intensive and rarely effective. The most effective method is to spot/blanket spray in late spring - autumn using Fusilade or Targa at 4l per ha. Brushcutting and raking off bulk of plant material prior to treatment often improves ease of removal and spraying.				
	Do not spray over winter as this plant does not actively grow at this time. Flauzifop-butyl can be used on couch occurring amongst native rushes and sedges as they are tolerant of this chemical. Ensure that the population requiring treatment is not <i>Sporobolus virginicus</i> , the native salt water couch.				

Species Name:	<i>Cyperus spp</i>	Control Priority	Location	Habit	Form
Common Name:		2	Dryland <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	May - July Oct - Jan		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads readily from rhizome growth and seed				Rush/Sedge <input checked="" type="checkbox"/>
Best Time of Control:	Nov - Jan				Grass <input type="checkbox"/>
Method of Control:	Spot spraying in summer using 150ml of Roundup in 15l of water + Pulse. Note, Biactive is more acceptable than other forms of Glyphosate for use over waterlogged areas. Repeated brushcutting to prevent flowering is also effective in the long term.				
	Identification is frequently difficult with these species so it is important to ensure that the plant to be controlled is a weed and not native to the area. Remove seed heads as a minimum control technique until such time as identification has been achieved.				

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

Ecosystem Management Services 1999



Species Name: *Cytisus proliferus* **Control Priority:** **Location:** **Habit:** **Form:**

Common Name: Tree lucerne 1 Dryland Bulb/Corm Tree

Seed Form: Coarse seed Riparian Perennial Shrub

Seeding Time: Aquatic Annual Herb

Method of Spread: Spreads mostly from seed Rush/Sedge

Best Time of Control: All year Grass

Method of Control: The most effective method is to cut the plant off at ground level. Treating the stump with chemical is not usually necessary, unless the stump is cut more than 20mm above ground level. Remove all plant material from the site. Climber

Kings Park recommends using Glyphosate at 1:15 on the cut stump.

Species Name: *Dipogon lignosus* **Control Priority:** **Location:** **Habit:** **Form:**

Common Name: Dolichos pea 2 Dryland Bulb/Corm Tree

Seed Form: Riparian Perennial Shrub

Seeding Time: Aquatic Annual Herb

Method of Spread: Spreads from both seed and vegetative growth Rush/Sedge

Best Time of Control: Grass

Method of Control: Hand removal of small populations. Spot spraying with Glyphosate 1 in 50 or 1:100, can be effective. Climber

At the moment, this plant is not extensively distributed around the waterways in the Perth Metropolitan area. It does have the potential however, to become a serious weed in this region - so works should focus where this species is present.

Species Name: *Echinochloa telmatophila* **Control Priority:** **Location:** **Habit:** **Form:**

Common Name: Barnyard grass 2 Dryland Bulb/Corm Tree

Seed Form: Coarse seed Riparian Perennial Shrub

Seeding Time: Oct - Dec Aquatic Annual Herb

Method of Spread: Spreads mostly from seed Rush/Sedge

Best Time of Control: July - Sept Grass

Method of Control: Remove small populations by hand. Hand weeding is preferred provided it will not increase erosion potential of any areas. As this plant occurs in wetlands, herbicide use is not preferred. Climber

Alternatively treat with Fusilladé or equivalent prior to flowering. Herbicide rates of 750ml to 2l dependent on plant size - prior to flowering.

Species Name: *Echium plantagineum* **Control Priority:** **Location:** **Habit:** **Form:**

Common Name: Paterson's curse 1 Dryland Bulb/Corm Tree

Seed Form: Coarse seed Riparian Perennial Shrub

Seeding Time: Nov - Jan Aquatic Annual Herb

Method of Spread: Spreads mostly from seed Rush/Sedge

Best Time of Control: July - Oct Grass

Method of Control: Hand weed small populations. Broader scale populations can be sprayed with Glyphosate. A rate of 75-100 ml per 15l of water is recommended by Kings Park Board staff. Climber

Control priority 1 - Major environmental weed, urgent control required
 Control priority 2 - Nuisance weed, control as soon as possible
 Control priority 3 - Minor weed, control as resources become available



Species Name:	<i>Ehrharta calycina</i>	Control Priority	Location	Habit	Form
Common Name:	Veldtgrass	<input type="checkbox"/> 1	Dryland <input checked="" type="checkbox"/> Riparian <input type="checkbox"/> Aquatic <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Annual <input type="checkbox"/>	Tree <input type="checkbox"/> Shrub <input type="checkbox"/> Herb <input type="checkbox"/> Rush/Sedge <input type="checkbox"/> Grass <input checked="" type="checkbox"/> Climber <input type="checkbox"/>
Seed Form:	Light, easily spread by wind				
Seeding Time:	March, April and Sept, Oct				
Method of Spread:	Spreads mostly from seed				
Best Time of Control:	Aug - Dec				
Method of Control:	Hand weed localised infestations. Repeated brushcutting of larger stands of the weed, close to root base has been effective, followed by spot/blanket spraying using Fusilade at 4l per ha or Sertin/Targa. It is important to tag any native plants persisting amongst stands of Veldtgrass to protect them from brushcutting activities. Hand weed grasses close to any native plants.				
	This plant represents a significant fire hazard in dense, extensive populations which generally occurs along disturbed road verges and fire access tracks.				

Species Name:	<i>Eragrostis curvula</i>	Control Priority	Location	Habit	Form
Common Name:	African love grass	<input type="checkbox"/> 1	Dryland <input checked="" type="checkbox"/> Riparian <input type="checkbox"/> Aquatic <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Annual <input type="checkbox"/>	Tree <input type="checkbox"/> Shrub <input type="checkbox"/> Herb <input type="checkbox"/> Rush/Sedge <input type="checkbox"/> Grass <input checked="" type="checkbox"/> Climber <input type="checkbox"/>
Seed Form:	Light, easily spread by wind				
Seeding Time:	June - Nov				
Method of Spread:	Spreads mostly from seed				
Best Time of Control:	Nov - March				
Method of Control:	Hand weed small infestations prior to mulching. Kings Park have found complete foliar spraying after fire or in summer months using Glyphosate 1l in 100l water and wetter e.g. Agral 60, X77 to be effective. Repeated brushcutting can be effective combined with herbicide treatment of regrowth. This minimises herbicide required by a reducing the amount of leaf material.				
	This plant represents a significant fire hazard and therefore a major threat to native vegetation. Do not set fire to on purpose but take advantage of easier access should any wildfire occur over summer.				

Species Name:	<i>Erodium moschatum</i>	Control Priority	Location	Habit	Form
Common Name:	Musky crowfoot	<input type="checkbox"/> 2	Dryland <input checked="" type="checkbox"/> Riparian <input type="checkbox"/> Aquatic <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/> Perennial <input type="checkbox"/> Annual <input checked="" type="checkbox"/>	Tree <input type="checkbox"/> Shrub <input type="checkbox"/> Herb <input checked="" type="checkbox"/> Rush/Sedge <input type="checkbox"/> Grass <input type="checkbox"/> Climber <input type="checkbox"/>
Seed Form:	Coarse seed				
Seeding Time:					
Method of Spread:	Spreads mostly from seed				
Best Time of Control:	June - Sept				
Method of Control:	Hand weeding is effective in predominantly native vegetation zones. This species is difficult to control due to the widespread nature of the populations.				

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

Ecosystem Management Services 1999



Species Name:	<i>Freesia aff leichthnii</i>	Control Priority	Location	Habit	Form
Common Name:	Freesia	2	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input checked="" type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Oct - Nov		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads by bulb or corm growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Aug - Sept				Grass <input type="checkbox"/>
Method of Control:	Small infestations can be dug out, bagged and removed from site. The sieving method outlined for <i>Watsonia</i> can be effective. Care needs to be taken to ensure that no corms are dropped when removing the plants from site - otherwise it will create more work in the future.				
	For large infestations Kings Park Board Staff recommend applying Glyphosate 1 in 100 or Brushoff 5g per ha just prior to flowering (August).				

Species Name:	<i>Fumaria capreolata</i>	Control Priority	Location	Habit	Form
Common Name:	Whiteflower fumitory	2	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Dec - Mar		Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	May - Sept				Grass <input type="checkbox"/>
Method of Control:	Hand weed prior to seeding.				Climber <input type="checkbox"/>

Species Name:	<i>Gladiolus spp</i>	Control Priority	Location	Habit	Form
Common Name:	Gladiolus	2	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input checked="" type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light, easily spread by wind		Riparian <input type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Feb-June		Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads by bulb/corm growth and seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Aug - Dec				Grass <input type="checkbox"/>
Method of Control:	Remove flower heads to prevent seed production. In heavy soils, handweed by digging around clump, sieving and shaking back sand. Can hand weed easily in dryland areas (Aug-Sept). Bag all the corms and dispose of carefully. It is possible to use herbicide for severe infestations including Glean, Brushoff and Glyphosate - using hand wiping technique.				

Species Name:	<i>Gomphocarpus fruticosus</i>	Control Priority	Location	Habit	Form
Common Name:	Cotton bush	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light and easily spread by wind		Riparian <input type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Nov - Dec		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Sept - Dec				Grass <input type="checkbox"/>
Method of Control:	Hand weed small plants prior to fruiting. Alternatively cut at or slightly below ground level and remove plant material. Selectively spraying the leaves with Glyphosate 1 in 100 is the suggested herbicide treatment.				
	Some people have adverse reactions to the sap of this plant. Wear gloves and take care when handling plant material.				

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

Ecosystem Management Services 1999



Species Name: *Hesperantha falcata* **Control Priority:** 1 2 3

Common Name: _____

Seed Form: Coarse seed

Seeding Time: _____

Method of Spread: Spreads by bulb or corm growth

Best Time of Control: _____

Method of Control: Kings Park Board staff have been unable to find little information about controlling this weed. This agency recommends using Glyphosate at a rate of 1 to 100 at flowering time, but because this plant has small leaves it is difficult to target. Trialling Glean/Brushoff is also recommended.

Location	Habit	Form
Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input checked="" type="checkbox"/>	Tree <input type="checkbox"/>
Riparian <input checked="" type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input checked="" type="checkbox"/>
		Rush/Sedge <input type="checkbox"/>
		Grass <input type="checkbox"/>
		Climber <input type="checkbox"/>

Species Name: *Homeria flaccida* **Control Priority:** 1 2 3

Common Name: One leaf cape tulip

Seed Form: _____

Seeding Time: _____

Method of Spread: Spreads by bulb or corm growth

Best Time of Control: _____

Method of Control: Removing these plants by hand can be effective if care is taken to remove all corms. For extensive populations, it is recommended that the plants are wiped with Glyphosate 1 in 10. It is important to note that not all corms re-shoot in a given year so it is essential to monitor and treat re-growth annually. This plant is toxic to stock.

Location	Habit	Form
Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input checked="" type="checkbox"/>	Tree <input type="checkbox"/>
Riparian <input type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input checked="" type="checkbox"/>
		Rush/Sedge <input type="checkbox"/>
		Grass <input type="checkbox"/>
		Climber <input type="checkbox"/>

Species Name: *Hordeum leporinum* **Control Priority:** 1 2 3

Common Name: Barley grass

Seed Form: Light seed

Seeding Time: Sept - Oct

Method of Spread: Spreads mostly from seed

Best Time of Control: July - August

Method of Control: Hand weeding is effective for small populations. Herbicide treatment using Fusillade at 2l per ha can work in bushland environments. Kings Park recommends spraying in July-Aug. It is important that hand weeding or spraying occurs before seed set.

Location	Habit	Form
Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Riparian <input type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input type="checkbox"/>
		Rush/Sedge <input type="checkbox"/>
		Grass <input checked="" type="checkbox"/>
		Climber <input type="checkbox"/>

Species Name: *Hyparrhenia hirta* **Control Priority:** 1 2 3

Common Name: Tambookie grass

Seed Form: Coarse seed

Seeding Time: _____

Method of Spread: Spreads mostly from seed

Best Time of Control: Nov - Mar

Method of Control: Hand weeding small plants prior to flowering is relatively easy. Brushcutting to remove most leaf material prior to herbicide treatment improves the effectiveness of the application. Fusillade at 4l per ha works best on new growth. Repeat treatments are likely to be required. This is a WA native grass which is extending its distribution as a result of disturbance and vehicle movement.

Location	Habit	Form
Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Riparian <input type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
		Rush/Sedge <input type="checkbox"/>
		Grass <input type="checkbox"/>
		Climber <input type="checkbox"/>

Control priority 1 - Major environmental weed, urgent control required
 Control priority 2 - Nuisance weed, control as soon as possible
 Control priority 3 - Minor weed, control as resources become available



Species Name:	<i>Hypochaeris radicata</i>	Control Priority	Location	Habit	Form
Common Name:	Flatweed	3	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light and easily spread by wind		Riparian <input type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Oct - Mar		Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	All year				Grass <input type="checkbox"/>
Method of Control:	Hand weeding is fast and effective prior to, or during flowering.				Climber <input type="checkbox"/>

Species Name:	<i>Ipomoea spp</i>	Control Priority	Location	Habit	Form
Common Name:	Morning glory	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:			Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads from both seed and vegetative growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:					Grass <input type="checkbox"/>
Method of Control:	Cut and remove existing growth, and then treat regrowth as it develops with Glyphosate at 300ml per 15l water with Pulse. This technique is preferred by the Kings Park Board staff.				Climber <input checked="" type="checkbox"/>

Continued effort to remove the bulk of the vegetative material, taking care not to drop segments, can also be helpful in minimising the need for herbicide use.

This plant is becoming increasingly dominant in highly urbanised streams and should be controlled.

Species Name:	<i>Isolepis prolifera</i>	Control Priority	Location	Habit	Form
Common Name:	Budding club rush	2	Dryland <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Dec - Feb		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads from both seed and vegetative growth				Rush/Sedge <input checked="" type="checkbox"/>
Best Time of Control:	Winter				Grass <input type="checkbox"/>
Method of Control:	This plant occurs in homogeneous clumps in seasonally waterlogged area. It may be worth trying to cover this weed with black plastic held down with rocks to drown the plant over winter.				Climber <input type="checkbox"/>

Rotary hoeing and spraying the regrowth with Glyphosate with surfactant can be effective. Kings Park Board suggests Glyphosate 1 to 20 plus Pulse. It is important to do this in summer following the frog breeding season and prior to the bird breeding season. Repeat treatments will be required.

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

Ecosystem Management Services 1999



Species Name: *Juncus articulatus* **Control Priority** **Location** **Habit** **Form**

Common Name: Articulated rush 2 Dryland Bulb/Corm Tree

Seed Form: Light seed Riparian Perennial Shrub

Seeding Time: Nov - Mar Aquatic Annual Herb

Method of Spread: Spreads mostly from seed Rush/Sedge

Best Time of Control: Sept - Mar Grass

Method of Control: Manually weeding all plants is the preferred method for removing this species. Climber

Ensure that the plants to be controlled have been correctly identified as the weed species. If unsure of weed status then removing the flowering heads to minimise spread is helpful and will not seriously interfere with the plants until they have been correctly identified.

Species Name: *Juncus capitatus* **Control Priority** **Location** **Habit** **Form**

Common Name: 3 Dryland Bulb/Corm Tree

Seed Form: Light seed Riparian Perennial Shrub

Seeding Time: Dec - mar Aquatic Annual Herb

Method of Spread: Spreads mostly from seed Rush/Sedge

Best Time of Control: Sept - Nov Grass

Method of Control: Manually weed small plants. The preferred method for removing larger clumps involves brushcutting to remove the bulk of material and then digging the plants out and removing the base and leaves from the site. Any regrowth from sections missed can then be slashed and treated with Glyphosate applied at half strength. Several applications may be required. Climber

Ensure that the plants to be controlled have been correctly identified as weed species. If unsure of weed status then removing the flowering heads to minimise spread is helpful and will not seriously interfere with the plants until they have been correctly identified.

Species Name: *Juncus microcephalus* **Control Priority** **Location** **Habit** **Form**

Common Name: 2 Dryland Bulb/Corm Tree

Seed Form: Light seed Riparian Perennial Shrub

Seeding Time: Dec - Mar Aquatic Annual Herb

Method of Spread: Spreads mostly from seed Rush/Sedge

Best Time of Control: Sept - Dec Grass

Method of Control: Manually weed small plants. The preferred method for removing larger clumps involves brushcutting to remove the bulk of material and then digging the plants out and removing the base and leaves from the site. Any regrowth from sections missed can then be slashed and treated with Glyphosate applied at half strength. Several applications may be required. Climber

This plant is a serious weed. Ensure correct identification prior to implementing weed control as this plant is similar to native rush and sedge species. Plants occurring on river banks should not be dug out as removal may create a new erosion problem. Use extra care when using herbicides close to the water.

Control priority 1 - Major environmental weed, urgent control required
 Control priority 2 - Nuisance weed, control as soon as possible
 Control priority 3 - Minor weed, control as resources become available



Species Name:	Lantana camara	Control Priority	Location	Habit	Form
Common Name:	Lantana	<input type="checkbox"/> 3	Dryland <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:			Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads from both seed and vegetative growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:					Grass <input type="checkbox"/>
Method of Control:	Hand weed (grub out) small communities. Spray localised populations with Glyphosate 1 in 10 covering all foliage.				Climber <input checked="" type="checkbox"/>

Monitoring re-occurrence of this plant in areas where previous control work has been undertaken is essential.

Species Name:	Leptospermum laevigatum	Control Priority	Location	Habit	Form
Common Name:	Victorian coastal teatree	<input type="checkbox"/> 1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input checked="" type="checkbox"/>
Seed Form:	Light, easily spread by wind		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	April - October		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	All year				Grass <input type="checkbox"/>
Method of Control:	Hand weed seedlings. For mature plants, cut stems to ground level annually until control is achieved. Remove flowering branches when possible.				Climber <input type="checkbox"/>

Note, in some cases where this weed provides shelter this should be done only after native plants have grown sufficiently to take their place.

Species Name:	Lolium spp.	Control Priority	Location	Habit	Form
Common Name:	Rye grass	<input type="checkbox"/> 2	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light, easily spread by wind		Riparian <input type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	March - June		Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Dec - Mar				Grass <input checked="" type="checkbox"/>
Method of Control:	Handweeding is preferred, except for extensive populations. Spot spraying of Sertin, Targa or similar at 4l per ha prior to flowering can be effective.				Climber <input type="checkbox"/>

In areas where steep banks are present and this species is dominant removing the seed heads to limit spread is preferred to complete removal, in order to ensure that bank stability is protected.

Species Name:	Lupinus angustifolia	Control Priority	Location	Habit	Form
Common Name:	Lupin	<input type="checkbox"/> 2	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Heavy seed		Riparian <input type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Oct - Dec		Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Aug - Oct				Grass <input type="checkbox"/>
Method of Control:	Handweed small populations. Alternatively, spray the plants selectively with Glyphosate 2% solution.				Climber <input type="checkbox"/>

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

Ecosystem Management Services 1999



Species Name: **Medicago spp** **Control Priority** **Location** **Habit** **Form**

Common Name: Medics 3 Dryland Bulb/Corm Tree
 Riparian Perennial Shrub
Seed Form: Light seed Aquatic Annual Herb
 Rush/Sedge
Seeding Time: Grass
Method of Spread: Spreads mostly from seed Climber

Best Time of Control: June - Sept

Method of Control: This plant may be controlled effectively with Glyphosate. Kings Park Board recommends a rate of 75-100ml in 15l of water.

Species Name: **Monopsis debilis** **Control Priority** **Location** **Habit** **Form**

Common Name: 3 Dryland Bulb/Corm Tree
 Riparian Perennial Shrub
Seed Form: Aquatic Annual Herb
 Rush/Sedge
Seeding Time: Grass
Method of Spread: Climber

Best Time of Control:

Method of Control: Pull out small populations to prevent them from spreading. Repeated rotary hoeing/mowing to prevent flowering can be helpful.

Kings Park Board staff suggest Glyphosate at 75-100ml in 15l of water prior to flowering.

Species Name: **Myrsiphyllum asparagoides** **Control Priority** **Location** **Habit** **Form**

Common Name: Bridal Creeper 1 Dryland Bulb/Corm Tree
 Riparian Perennial Shrub
Seed Form: Light seed Aquatic Annual Herb
 Rush/Sedge
Seeding Time: Oct - Dec Grass
Method of Spread: Spreads from both seed and vegetative growth Climber

Best Time of Control: Jul - Sept

Method of Control: Remove young plants by hand as they appear. If spraying, remove the bulk of the plant material prior to spraying then treat the smaller biomass of plants approximately a fortnight later. Kings Park currently recommends using either Glyphosate 360 at a rate of 1 in 100, or 2.5 to 5g per ha in 250l of water. Repeat applications will be required for either chemical.

Kings Park may have more up to date control measures. It is essential to take extreme care when treating this plant as it generally occurs within close proximity of native plants, and causing the unintentional death of non-target plants is possible.

Species Name: **Narcissus tazetta** **Control Priority** **Location** **Habit** **Form**

Common Name: Jonquil 2 Dryland Bulb/Corm Tree
 Riparian Perennial Shrub
Seed Form: Coarse seed Aquatic Annual Herb
 Rush/Sedge
Seeding Time: Grass
Method of Spread: Spreads by bulb or corm growth Climber

Best Time of Control: Winter - Spring

Method of Control: Removing these plants by hand can be effective if care is taken to remove all corms. For extensive populations, it is recommended that the plants are wiped with Glyphosate 1 in 10.

It is important to note that not all corms re-shoot in a given year so it is essential to monitor and treat re-growth annually. This plant is toxic to stock.

Control priority 1 - Major environmental weed, urgent control required
Control priority 2 - Nuisance weed, control as soon as possible
Control priority 3 - Minor weed, control as resources become available

Ecosystem Management Services 1999



Species Name:	<i>Nerium oleander</i>	Control Priority	Location	Habit	Form
Common Name:	Oleander	<input type="checkbox"/> 3	Dryland <input checked="" type="checkbox"/> Riparian <input type="checkbox"/> Aquatic <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Annual <input type="checkbox"/>	Tree <input type="checkbox"/> Shrub <input checked="" type="checkbox"/> Herb <input type="checkbox"/> Rush/Sedge <input type="checkbox"/> Grass <input type="checkbox"/> Climber <input type="checkbox"/>
Seed Form:	Coarse seed				
Seeding Time:					
Method of Spread:	Spreads from both seed and vegetative growth				
Best Time of Control:	All year				
Method of Control:	Dig out the individual plants. Otherwise cut the stumps and paint with full strength systemic herbicide.				

Species Name:	<i>Olea europaea</i>	Control Priority	Location	Habit	Form
Common Name:	Olive tree	<input type="checkbox"/> 2	Dryland <input checked="" type="checkbox"/> Riparian <input type="checkbox"/> Aquatic <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Annual <input type="checkbox"/>	Tree <input checked="" type="checkbox"/> Shrub <input type="checkbox"/> Herb <input type="checkbox"/> Rush/Sedge <input type="checkbox"/> Grass <input type="checkbox"/> Climber <input type="checkbox"/>
Seed Form:	Heavy seed				
Seeding Time:	Nov - Jan				
Method of Spread:	Spreads mostly from seed				
Best Time of Control:					
Method of Control:	Hand weed juvenile plants. For small plants, selectively spray foliage with full strength Glyphosate. Larger trees can be managed by either cutting the stump and painting with Glyphosate or Garlon (recommended by Kings Park Board staff), or alternatively injecting into the stem at 15 cm intervals. Follow up treatments may be required.				

Encouraging fruit harvesting by residents will reduce the rate of spread of this weed.

Species Name:	<i>Oxalis pes-caprae</i>	Control Priority	Location	Habit	Form
Common Name:	Soursob	<input type="checkbox"/> 2	Dryland <input type="checkbox"/> Riparian <input type="checkbox"/> Aquatic <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/> Perennial <input type="checkbox"/> Annual <input type="checkbox"/>	Tree <input type="checkbox"/> Shrub <input type="checkbox"/> Herb <input type="checkbox"/> Rush/Sedge <input type="checkbox"/> Grass <input type="checkbox"/> Climber <input type="checkbox"/>
Seed Form:	Light seed				
Seeding Time:	Sept				
Method of Spread:	Spreads by runners				
Best Time of Control:	July - Sept				
Method of Control:	Hand weeding can be effective provided that care is taken to trace all runners from the parent plant and that no stem and root is left behind.				
	Apply Glyphosate 75ml in 10l in winter or before foliage starts to yellow.				

Species Name:	<i>Panicum capillare</i>	Control Priority	Location	Habit	Form
Common Name:	Witchgrass	<input type="checkbox"/> 3	Dryland <input checked="" type="checkbox"/> Riparian <input type="checkbox"/> Aquatic <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/> Perennial <input type="checkbox"/> Annual <input checked="" type="checkbox"/>	Tree <input type="checkbox"/> Shrub <input type="checkbox"/> Herb <input type="checkbox"/> Rush/Sedge <input type="checkbox"/> Grass <input checked="" type="checkbox"/> Climber <input type="checkbox"/>
Seed Form:					
Seeding Time:					
Method of Spread:	Spreads mostly from seed				
Best Time of Control:					
Method of Control:	As with most introduced grasses, Fusillade at 2l per ha can be effective. The herbicide should be applied prior to flowering.				
	This species has the potential to spread rapidly through wetland environments.				

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

Ecosystem Management Services 1999



Species Name:	<i>Paspalum spp</i>	Control Priority	Location	Habit	Form
Common Name:	Paspalum	<input type="checkbox"/> 2	Dryland <input checked="" type="checkbox"/> Riparian <input checked="" type="checkbox"/> Aquatic <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Annual <input type="checkbox"/>	Tree <input type="checkbox"/> Shrub <input type="checkbox"/> Herb <input type="checkbox"/> Rush/Sedge <input type="checkbox"/> Grass <input checked="" type="checkbox"/> Climber <input type="checkbox"/>
Seed Form:	Heavy seed				
Seeding Time:	Dec - Jan				
Method of Spread:	Spreads from both seed and vegetative growth				
Best Time of Control:	Aug - Mar				
Method of Control:	Repeated brushcutting/slashing can be effective in controlling this plant - provided it occurs prior to seed development. The accepted herbicide treatment is the application of Fusillade at 4l per ha.				
	It is possible to reduce the volume of herbicide required by slashing/rotary hoeing and then treating the regrowth.				

Species Name:	<i>Pelargonium capitatum</i>	Control Priority	Location	Habit	Form
Common Name:	Rose pelargonium	<input type="checkbox"/> 1	Dryland <input checked="" type="checkbox"/> Riparian <input type="checkbox"/> Aquatic <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Annual <input type="checkbox"/>	Tree <input type="checkbox"/> Shrub <input type="checkbox"/> Herb <input checked="" type="checkbox"/> Rush/Sedge <input type="checkbox"/> Grass <input type="checkbox"/> Climber <input type="checkbox"/>
Seed Form:	Light, easily spread by wind				
Seeding Time:	Jan - April				
Method of Spread:	Spreads from both seed and vegetative growth				
Best Time of Control:	Spring				
Method of Control:	Hand weed in autumn / winter, trying very hard not leave any stem or root behind as the plants will reshoot. Kings Park suggests the two herbicide treatments listed. Spot Spray with Ally/Brush 5g per ha or spray with Glyphosate 1 in 100 with wetting agent in early September.				
	This plant is an effective coloniser and it may smother any small native plants present.				

Species Name:	<i>Pennisetum clandestinum</i>	Control Priority	Location	Habit	Form
Common Name:	Kikuyu	<input type="checkbox"/> 1	Dryland <input checked="" type="checkbox"/> Riparian <input checked="" type="checkbox"/> Aquatic <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Annual <input type="checkbox"/>	Tree <input type="checkbox"/> Shrub <input type="checkbox"/> Herb <input type="checkbox"/> Rush/Sedge <input type="checkbox"/> Grass <input checked="" type="checkbox"/> Climber <input type="checkbox"/>
Seed Form:	Sterile or non seed producing				
Seeding Time:					
Method of Spread:	Spreads readily from rhizome growth				
Best Time of Control:	Sept - Dec				
Method of Control:	The most effective technique recognised is the application of Fusillade at a rate of 4l per ha while the plant is actively growing.				
	Fusillade should not be applied over open water. Native rushes and sedges are not at risk when using this chemical.				

Species Name:	<i>Plantago lanceolata</i>	Control Priority	Location	Habit	Form
Common Name:	Ribwort plantain	<input type="checkbox"/> 3	Dryland <input checked="" type="checkbox"/> Riparian <input type="checkbox"/> Aquatic <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Annual <input type="checkbox"/>	Tree <input type="checkbox"/> Shrub <input type="checkbox"/> Herb <input checked="" type="checkbox"/> Rush/Sedge <input type="checkbox"/> Grass <input type="checkbox"/> Climber <input type="checkbox"/>
Seed Form:	Coarse seed				
Seeding Time:					
Method of Spread:	Spreads mostly from seed				
Best Time of Control:	Nov - Dec				
Method of Control:	Pull Ribwort by hand ensuring that tap root is properly removed. Generally populations of this weed are limited and can be managed effectively using manual weed control methods. Kings Park Board recommends wiping with Glyphosate 100ml in 15l water.				

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

Ecosystem Management Services 1999



Species Name:	Populus spp	Control Priority	Location	Habit	Form
Common Name:	Poplar	<input type="checkbox"/> 2	Dryland <input checked="" type="checkbox"/> Riparian <input type="checkbox"/> Aquatic <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Annual <input type="checkbox"/>	Tree <input checked="" type="checkbox"/> Shrub <input type="checkbox"/> Herb <input type="checkbox"/> Rush/Sedge <input type="checkbox"/> Grass <input type="checkbox"/> Climber <input type="checkbox"/>
Seed Form:					
Seeding Time:					
Method of Spread:	Spreads from suckers				
Best Time of Control:	Oct - Feb				
Method of Control:	Experience indicates that injecting concentrated systemic herbicide at 10 - 15 cm intervals around the trunk can be effective, and reduces the number of suckers which can occur following the cut stump technique. Kings Park considers this plant difficult to control and recommends the cut stump method with Garlon 600.				

Species Name:	Raphanus raphanistrum	Control Priority	Location	Habit	Form
Common Name:	Wild radish	<input type="checkbox"/> 3	Dryland <input checked="" type="checkbox"/> Riparian <input checked="" type="checkbox"/> Aquatic <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Annual <input type="checkbox"/>	Tree <input type="checkbox"/> Shrub <input type="checkbox"/> Herb <input checked="" type="checkbox"/> Rush/Sedge <input type="checkbox"/> Grass <input type="checkbox"/> Climber <input type="checkbox"/>
Seed Form:	Light seed				
Seeding Time:	Dec				
Method of Spread:	Spreads mostly from seed				
Best Time of Control:	Sept - Nov				
Method of Control:	Removing these species by hand is easy and can be done very quickly. Removal should occur prior to the plants flowering and seeding to reduce the rate of spread. Bagging and cutting the seeding stems, from any plants, should be undertaken prior to removal.				

The alternative is to paint with Glyphosate 1 in 10.

Species Name:	Rhynchosyris repens	Control Priority	Location	Habit	Form
Common Name:	Red natal grass	<input type="checkbox"/> 1	Dryland <input checked="" type="checkbox"/> Riparian <input type="checkbox"/> Aquatic <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Annual <input type="checkbox"/>	Tree <input type="checkbox"/> Shrub <input type="checkbox"/> Herb <input type="checkbox"/> Rush/Sedge <input type="checkbox"/> Grass <input checked="" type="checkbox"/> Climber <input type="checkbox"/>
Seed Form:	Light and easily spread by wind				
Seeding Time:	Sept - Nov				
Method of Spread:	Spreads mostly from seed				
Best Time of Control:	June to Aug				
Method of Control:	This plant is effectively controlled using Fusillade at a rate of 4l per ha (as for most other introduced grasses).				

Species Name:	Ricinus communis	Control Priority	Location	Habit	Form
Common Name:	Castor Oil	<input type="checkbox"/> 1	Dryland <input checked="" type="checkbox"/> Riparian <input type="checkbox"/> Aquatic <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Annual <input type="checkbox"/>	Tree <input checked="" type="checkbox"/> Shrub <input type="checkbox"/> Herb <input type="checkbox"/> Rush/Sedge <input type="checkbox"/> Grass <input type="checkbox"/> Climber <input type="checkbox"/>
Seed Form:	Heavy seed				
Seeding Time:	Nov - Jan				
Method of Spread:	Spreads mostly from seed				
Best Time of Control:	Any time but best prior to fruiting				
Method of Control:	Small populations can be removed by hand. Individual plants can be cut and painted with Glyphosate. Populations of seedlings can be sprayed with Glyphosate 1 in 80, while injecting large plants with a systemic herbicide is effective.				

The seed from this plant has been shown to be viable more than 1 000 years later, so vigilance is required to remove plants prior to seeding.

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

Ecosystem Management Services 1999



Species Name:	Romulea rosea	Control Priority	Location	Habit	Form
Common Name:	Guildford grass	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input checked="" type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input checked="" type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads by bulb or corm growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:					Grass <input checked="" type="checkbox"/>
Method of Control:	In areas with homogeneous populations, Kings Park Board suggests Brushoff / Ally can give good control and can be used over some turf species. Repeated rotary hoeing and slashing prior to flowering can assist in managing populations.				

Species Name:	Rorippa nasturtium-aquaticum	Control Priority	Location	Habit	Form
Common Name:	Watercress	2	Dryland <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input checked="" type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads from both seed and vegetative growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Access dependent				Grass <input type="checkbox"/>
Method of Control:	This aquatic weed is difficult to control because it slows water movement, increases sedimentation and reduces erosion which means implementing control can affect bed and bank stability. The recommended removal technique involves manual clearing of a channel and also clearing 5 to 10 m wide bands, 20 metres apart which are perpendicular to the stream flow. This will minimise the potential for de-stabilising the stream bed.				
	Seek expert advice and approvals from the relevant government agencies prior to implementing broad scale works.				

Species Name:	Rubus spp	Control Priority	Location	Habit	Form
Common Name:	Blackberry	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Heavy seed		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input checked="" type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads from both seed and vegetative growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Dec - April				Grass <input type="checkbox"/>
Method of Control:	Brush cut and remove brambles. Hand weed removing knotty stumps and as much root as possible. Paint regrowth with Glyphosate 12ml to 1l of water. Better control is often achieved with a combination of Brushoff, Garlon or blackberry and tree killer. Biological controls using a rust fungus have been successful. Agriculture WA may be able to assist with this.				
	Brushcutting these plants can provide very difficult and using a team of goats as the first method of attack can prove very useful in terms of increasing access and removing the bulk of the vegetative material. It is important that any blackberry control takes into consideration fauna corridors in continuous strips of sufficient width to discourage predators, particularly to protect birds and bandicoots.				

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

Ecosystem Management Services 1999



Species Name:	Rumex spp	Control Priority	Location	Habit	Form
Common Name:	Dock	2	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light and easily spread by wind		Riparian <input type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	March - June		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Nov - Mar				Grass <input type="checkbox"/>
Method of Control:	These plants are readily eradicated through hand weeding. Remove flowering heads prior to seed ripening if complete plant removal is not possible.				
	Always bag plants with seeds and dispose of carefully.				

Species Name:	Salix spp	Control Priority	Location	Habit	Form
Common Name:	Willow	1	Dryland <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input checked="" type="checkbox"/>
Seed Form:	Heavy seed		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads from suckers				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Dec - Mar				Grass <input type="checkbox"/>
Method of Control:	Small plants can be removed by hand. Mature plants can be injected with full strength Glyphosate at 10 - 15 cm intervals around the trunk. Any suckers which appear can be painted with systemic herbicide. It is important not to remove the parent plant until it is dead and no more suckers are being produced.				
	Removal of willows along watercourses can have a detrimental effect through loss of habitat, streamside erosion and exposure of understorey. Consideration should be given to replacing the plants to be removed two years prior to undertaking removal.				

Species Name:	Schinus terebinthifolius	Control Priority	Location	Habit	Form
Common Name:	Japanese pepper	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input checked="" type="checkbox"/>
Seed Form:	Coarse seed		Riparian <input type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Sept		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads from suckers and seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	All year, but in wetlands treat in summer				Grass <input type="checkbox"/>
Method of Control:	Hand weed small seedlings. It is important to monitor for any new germinants to enable rapid removal from the site. Treating the large plants can be undertaken either by cutting the trunk and immediately painting the stump, or alternatively injecting systemic herbicide at 10 - 15 cm intervals around the trunk. Kings Park recommends either Glyphosate, Velpar or Garlon.				
	The seed is spread predominantly by introduced birds and there is some anecdotal evidence that many native birds are poisoned by the seeds.				

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

Ecosystem Management Services 1999



Species Name: *Solanum nigrum* **Control Priority** **Location** **Habit** **Form**

Common Name: Deadly nightshade **1** Dryland Bulb/Corm Tree
 Riparian Perennial Shrub
Seed Form: Coarse seed Aquatic Annual Herb
Seeding Time: Oct - Dec Rush/Sedge
Method of Spread: Spreads mostly from seed Grass
 Climber
Best Time of Control: Sept - Oct
Method of Control: Hand weed small infestations. Kings Park Board recommends using Glyphosate 1 in 100. Dessicant herbicides applied to all parts of the plant can be effective on warm to hot days.

Species Name: *Stachys arvensis* **Control Priority** **Location** **Habit** **Form**

Common Name: Staggerweed **3** Dryland Bulb/Corm Tree
 Riparian Perennial Shrub
Seed Form: Heavy seed Aquatic Annual Herb
Seeding Time: Rush/Sedge
Method of Spread: Spreads mostly from seed Grass
 Climber
Best Time of Control:
Method of Control: Pull out small populations to prevent them from spreading. Repeated rotary hoeing/mowing to prevent flowering can be helpful where there are no remnant native species.
 Kings Park Board staff suggest Glyphosate at 75-100ml in 15l of water prior to flowering.

Species Name: *Stenotaphrum secundatum* **Control Priority** **Location** **Habit** **Form**

Common Name: Buffalo grass **1** Dryland Bulb/Corm Tree
 Riparian Perennial Shrub
Seed Form: Sterile or non seed producing Aquatic Annual Herb
Seeding Time: Rush/Sedge
Method of Spread: Spreads readily from rhizome growth Grass
 Climber
Best Time of Control: Aug - Sept
Method of Control: Hand weeding is very difficult, labour intensive and rarely successful. The most effective method is to implement a minimum of two spot/blanket treatments in Aug-Oct and April-May using Fusillade or Targa at 4l per ha. Brushcutting often improves ease of removal and spraying.
 This process typically requires more than two treatments. Can implement spraying amongst native rushes and sedges which have been demonstrated to tolerate flauzifop-butyl.

Species Name: *Taraxacum officinale* **Control Priority** **Location** **Habit** **Form**

Common Name: Dandelion **2** Dryland Bulb/Corm Tree
 Riparian Perennial Shrub
Seed Form: Light, easily spread by wind Aquatic Annual Herb
Seeding Time: All year round Rush/Sedge
Method of Spread: Spreads mostly from seed Grass
 Climber
Best Time of Control: Sept - Nov
Method of Control: Hand weeding is the most effective means of control ensuring that if seed heads are present, they are carefully bagged prior to removal of the plant.
 Wiping with Glyphosate is also effective.

Control priority 1 - Major environmental weed, urgent control required
 Control priority 2 - Nuisance weed, control as soon as possible
 Control priority 3 - Minor weed, control as resources become available



Species Name:	<i>Thunbergia alata</i>	Control Priority	Location	Habit	Form
Common Name:	Black-eyed Susan	2	Dryland <input checked="" type="checkbox"/> Riparian <input checked="" type="checkbox"/> Aquatic <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Annual <input type="checkbox"/>	Tree <input type="checkbox"/> Shrub <input type="checkbox"/> Herb <input type="checkbox"/> Rush/Sedge <input type="checkbox"/> Grass <input type="checkbox"/> Climber <input checked="" type="checkbox"/>
Seed Form:	Coarse seed				
Seeding Time:					
Method of Spread:	Spreads from both seed and vegetative growth				
Best Time of Control:					
Method of Control:	Remove small plants manually. Spot spraying with Glyphosate at a rate of 1 in 50 can be effective.				

This plant poses a serious threat to the State's waterways and any small populations should be worked on quickly to reduce the potential spread.

Species Name:	<i>Trifolium spp.</i>	Control Priority	Location	Habit	Form
Common Name:	Clovers	3	Dryland <input checked="" type="checkbox"/> Riparian <input checked="" type="checkbox"/> Aquatic <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/> Perennial <input type="checkbox"/> Annual <input checked="" type="checkbox"/>	Tree <input type="checkbox"/> Shrub <input type="checkbox"/> Herb <input checked="" type="checkbox"/> Rush/Sedge <input type="checkbox"/> Grass <input type="checkbox"/> Climber <input type="checkbox"/>
Seed Form:	Heavy seed				
Seeding Time:					
Method of Spread:	Spreads mostly from seed				
Best Time of Control:					
Method of Control:	Hand weed small populations. Spraying populations with Glyphosate at 75 - 100 ml in 15l of water is recommended by Kings Park Board. Repeated rotary hoeing with follow up spraying can be effective in pasture situations.				

Species Name:	<i>Tropaeolum majus</i>	Control Priority	Location	Habit	Form
Common Name:	Nasturtium	3	Dryland <input checked="" type="checkbox"/> Riparian <input checked="" type="checkbox"/> Aquatic <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/> Perennial <input type="checkbox"/> Annual <input checked="" type="checkbox"/>	Tree <input type="checkbox"/> Shrub <input type="checkbox"/> Herb <input type="checkbox"/> Rush/Sedge <input type="checkbox"/> Grass <input type="checkbox"/> Climber <input checked="" type="checkbox"/>
Seed Form:	Heavy seed				
Seeding Time:	Nov - Jan				
Method of Spread:	Spreads mostly from seed				
Best Time of Control:	Aug / Sept				
Method of Control:	Removing this species by hand is effective. Selectively applying Glyphosate 1 in 100 can be effective.				

Awareness campaigns about the implications of dumping garden waste in reserves need to be upgraded and implemented intensively to discourage such activities.

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

Ecosystem Management Services 1999



Species Name: *Typha orientalis* **Control Priority:** 1 **Location:** Dryland Riparian Aquatic **Habit:** Bulb/Corm Perennial Annual **Form:** Tree Shrub Herb Rush/Sedge Grass Climber

Common Name: Bulrush

Seed Form: Light, easily spread by wind

Seeding Time:

Method of Spread: Spreads readily from rhizome growth and seed

Best Time of Control: Winter

Method of Control: Remove seed heads prior to ripening in September - December. Cut stems below water level in May, if sufficient water is present, monitor regrowth and continue to cut until September to drown the plants.

For populations occurring in waterlogged areas only use Glyphosate BioActive 1 to 10 in spring, after slashing plants first and wipe new growth when plants are 1m tall. Take care when using herbicide over water.

The native cumbungi, *Typha domingensis*, looks similar to Bulrush and it is important to ensure that the population being controlled is in fact the weed species.

Species Name: *Ursinia anthemoides* **Control Priority:** 3 **Location:** Dryland Riparian Aquatic **Habit:** Bulb/Corm Perennial Annual **Form:** Tree Shrub Herb Rush/Sedge Grass Climber

Common Name: Ursinia

Seed Form: Light seed

Seeding Time:

Method of Spread:

Best Time of Control:

Method of Control: Pull out small populations to prevent them from spreading. Repeated rotary hoeing/mowing to prevent flowering can be helpful.

Kings Park Board staff suggest Glyphosate at 75-100ml in 15l of water prior to flowering.

Species Name: *Vicia sativa* **Control Priority:** 3 **Location:** Dryland Riparian Aquatic **Habit:** Bulb/Corm Perennial Annual **Form:** Tree Shrub Herb Rush/Sedge Grass Climber

Common Name: Vetch

Seed Form: Heavy seed

Seeding Time:

Method of Spread: Spreads from both seed and vegetative growth

Best Time of Control:

Method of Control: Kings Park recommends trying Glyphosate 75ml in 15 l when the plants are actively growing. Hand weeding small populations is possible and effective.

Species Name: *Vinca major* **Control Priority:** 3 **Location:** Dryland Riparian Aquatic **Habit:** Bulb/Corm Perennial Annual **Form:** Tree Shrub Herb Rush/Sedge Grass Climber

Common Name: Periwinkle

Seed Form: Coarse seed

Seeding Time:

Method of Spread: Spreads by runners

Best Time of Control: June - Aug

Method of Control: It is generally recommended that this weed is managed by applying Glyphosate at 1 in 10 with surfactant.

Applications will need to be repeated several times at intervals of one month.

Control priority 1 - Major environmental weed, urgent control required
Control priority 2 - Nuisance weed, control as soon as possible
Control priority 3 - Minor weed, control as resources become available



Species Name:	Watsonia bulbifera	Control Priority	Location	Habit	Form
Common Name:	Watsonia	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input checked="" type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light and easily spread by wind and wat		Riparian <input checked="" type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	March - May		Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads by bulb/corm growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:					Grass <input type="checkbox"/>
Method of Control:					Climber <input type="checkbox"/>

Best Time of Control:**Method of Control:**

Remove corms by carefully digging a large area around each plant, putting the sand onto flywire, sieving and collecting all the corms. Flowers should also be harvested to prevent the production of seed and subsequent spread. The collected corms should be disposed of carefully.

Broadscale removal of dense stands may threaten bank stability. Remove in nodes along the waterway.

Selectively spray a combination of herbicides between July to August using Gleen and Alty/Brushoff and subsequently painting leaf with Glyphosate in September to November can be effective. Remove the bulk of dead biomass leaving the rhizome mats in tact.

Species Name:	Zantedeschia aethiopica	Control Priority	Location	Habit	Form
Common Name:	Arum lily	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Coarse seed		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Dec		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads from both seed and vegetative growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	April - Nov				Grass <input type="checkbox"/>
Method of Control:					Climber <input type="checkbox"/>

Best Time of Control:**Method of Control:**

Entire plants can be removed by digging - make sure to remove all of the rhizome. Spot spray from April to November using Glyphosate 1 in 100 or Gleen Alty/Brushoff 1 in 50 (20g per ha). Respraying is likely to be required 8 weeks later.

In wetland environments Roundup Biactive should be used to minimise fauna losses.

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

Ecosystem Management Services 1999





Appendix 3

Suggested species for revegetation works



Appendix 3: Suggested species for revegetation works

Species	Common Name	Location								Habitat							
		Roley Pool	Wright Brook	Breera Brook	Bannister Creek	Bennett Brook	Ellen Brook	Southern Wood Creek	Upper Canning	Dryland	Bank	Emergent					
<u>1. Spreading tree</u>																	
<i>Banksia attenuata</i>	Slender banksia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Banksia littoralis</i>	Swamp banksia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Banksia menziesii</i>	Firewood banksia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Casuarina obesa</i>	Saltwater sheoak	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Corymbia calophylla</i>	Marri	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Eucalyptus marginata</i>	Jarrah	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Eucalyptus rudis</i>	Flooded gum	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Eucalyptus wandoo</i>	Wandoo	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Paraserianthes lophantha</i>	Native albizia	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<u>2. Compact tree</u>																	
<i>Eucalyptus todliana</i>	Coastal blackbutt	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Melaleuca cuticularis</i>	Saltwater paperbark	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Melaleuca preissiana</i>	Modong	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Melaleuca raphiophylla</i>	Swamp paperbark	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Nuytsia floribunda</i>	Christmas tree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<u>3. Large shrub</u>																	
<i>Acacia saligna</i>	Coojong	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Agonis linearifolia</i>	Swamp peppermint	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Dryandra sessilis</i>	Parrot bush	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Grevillea diversifolia</i>	Variable leaved grevillea	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Melaleuca incana</i>	Grey honeymyrtle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Melaleuca teretifolia</i>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

This information is site specific to the sections of assessed foreshore. Please seek expert advice if placing these species outside of the surveyed sections.

Copyright Ecosystem Management Services 1999

Species	Common Name	Location								Habitat		
		Roley Pool	Wright Brook	Breera Brook	Bannister Creek	Bennett Brook	Ellen Brook	Southern Wood Creek	Upper Canning	Dryland	Bank	Emergent
<i>Melaleuca viminea</i>	Mohan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<i>Oxylobium lineare</i>	River pea	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Viminaria juncea</i>	Swishbush	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Medium shrub												
<i>Acacia pulchella</i>	Prickly moses	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Astartea fascicularis</i>	Common Astartea	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Darwinia cilirodora</i>	Lemon scented darwinia	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Hakea varia</i>	Harsh hakea	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Hibbertia spp</i>	Native buttercups	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Jacksonia furcellata</i>	Grey stinkwood	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Jacksonia stembergiana</i>	Green stinkwood	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Kunzea ericifolia</i>	Spearwood	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Lasiopetalum bracteatum</i>	Helena Velvet Bush	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Melaleuca lateritia</i>	Robin Red-breast bush	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Melaleuca viminea</i>	Mohan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Pericalymma ellipticum</i>	Swamp teatree	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Pteridium esculentum</i>	Bracken fern	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Regalia ciliata</i>	Regalia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Thomasia macrocarpa</i>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Low shrub												
<i>Acacia alata</i>	Winged wattle	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<i>Acanthocarpus preissii</i>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Bossiaea spp</i>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Corynotheca micrantha</i>	Sand lily	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Gompholobium tomentosum</i>	Hairy yellow pea	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

This information is site specific to the sections of assessed foreshore. Please seek expert advice if placing these species outside of the surveyed sections.

Copyright Ecosystem Management Services 1999



Species	CommonName	Location								Habitat		
		Roley Pool	Wright Brook	Breera Brook	Bannister Creek	Bennett Brook	Ellen Brook	Southern Wood Creek	Upper Canning	Dryland	Bank	Emergent
<i>Hakea prostrata</i>	Harsh Hakea	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Hypocalymma angustifolium</i>	White myrtle	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Hypocalymma robustum</i>	Swan River myrtle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<i>Leucopogon spp</i>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Macrozamia riedlei</i>	Zamia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Verticordia spp</i>	Featherflowers	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6. Ground cover												
<i>Centella cordifolia</i>	Centella	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Conostylis candicans</i>	Grey cottonhead	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Cotula coronopifolia</i>	Waterbuttons	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<i>Dryandra nivea</i>	Couch honeypots	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Hemarthria uncinata</i>	Mat grass	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<i>Hemiandra pungens</i>	Snake bush	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Patersonia occidentalis</i>	Western iris	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Sporobolus virginicus</i>	Saltwater couch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
7. Climber												
<i>Clematis pubescens</i>	Common clematis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Hardenbergia comptoniana</i>	Native wisteria	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Kennedia coccinea</i>	Coral creeper	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Kennedia prostrata</i>	Running postman	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Rush or Sedge												
<i>Juncus subsecundus</i>	Finger rush	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Baumea articulata</i>	Jointed twig sedge	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Baumea juncea</i>	Bare twig rush	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Baumea preissii</i>	Broad twig sedge	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

This information is site specific to the sections of assessed foreshore. Please seek expert advice if placing these species outside of the surveyed sections.

Copyright Ecosystem Management Services 1999

Species	CommonName	Location							Habitat		
		Roley Pool	Wright Brook	Breera Brook	Bannister Creek	Ennet Brook	Ellen Brook	Southern Wood Creek	Upper Canning	Dryland	Bank
<i>Baumea rubiginosa</i>	River twig	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Bolboschoenus caldwellii</i>	Marsh club rush	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Carex appressa</i>	Tall sedge	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Carex divisa</i>	Divided sedge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Carex fascicularis</i>	Tassel sedge	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Carex tereticaulis</i>	Tube sedge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<i>Centrolepis spp</i>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<i>Eleocharis acuta</i>	Spike sedge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Isolepis nodosa</i>	Knotted Club sedge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<i>Isolepis setiformis</i>	Tufted sedge	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<i>Juncus holoschoenus</i>	Joint-leaf rush	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<i>Juncus kraussii</i>	Shore rush	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Juncus pallidus</i>	Pale rush	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Juncus pauciflorus</i>	Slender rush	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Lepidosperma effusum</i>	Spreading sword sedge	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Lepidosperma longitundinella</i>	Pithy sword sedge	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Lepidosperma tetraquetrum</i>	Angle sword sedge	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Restio spp</i>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<i>Schoenoplectus validus</i>	Lake Club Sedge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

This information is site specific to the sections of assessed foreshore. Please seek expert advice if placing these species outside of the surveyed sections.

Copyright Ecosystem Management Services 1999



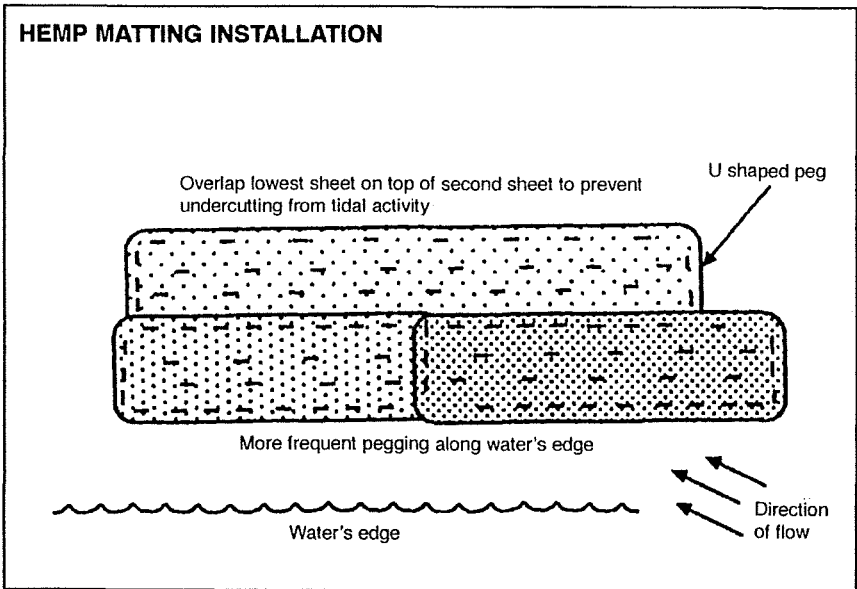
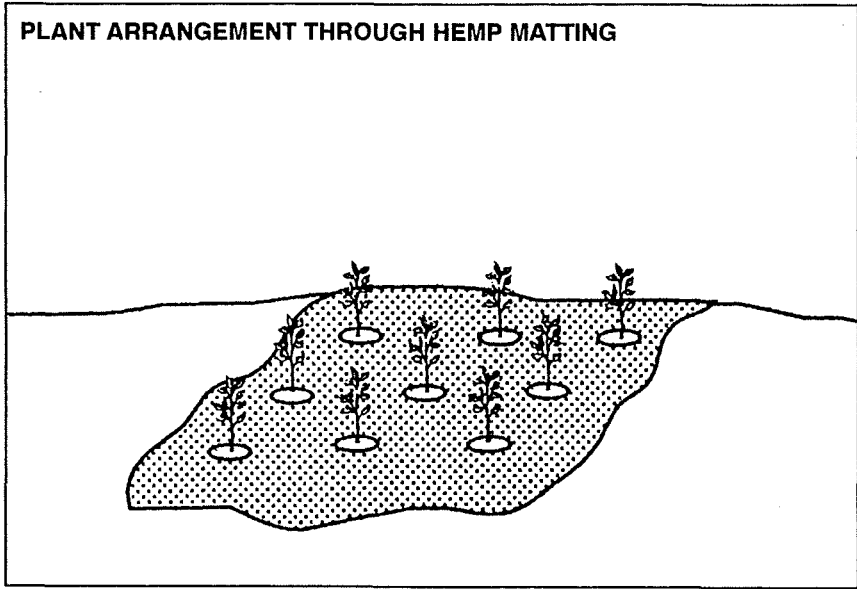
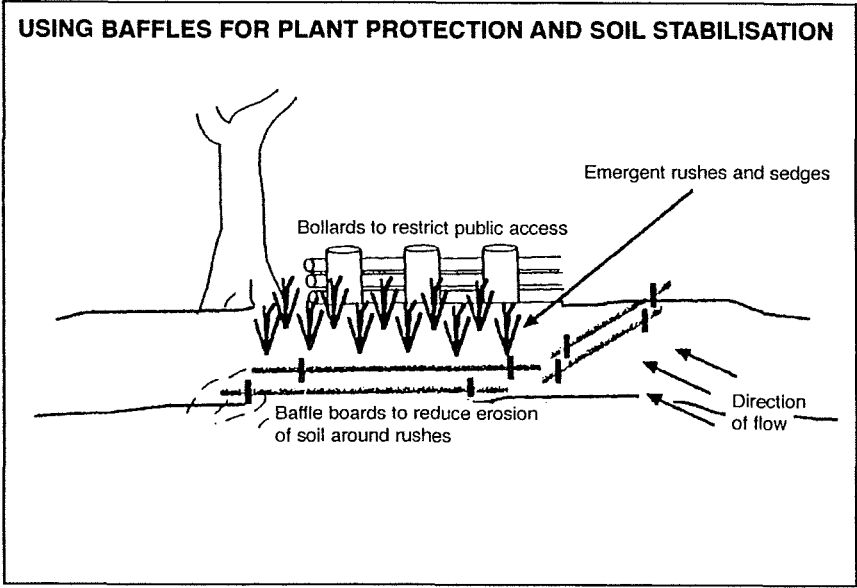
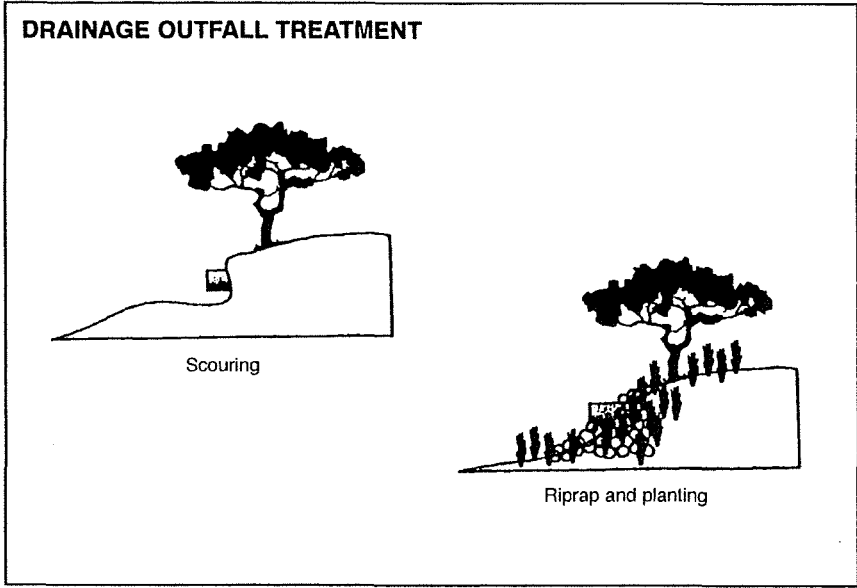


Appendix 4

Suggested soft engineering works



Appendix 4: Suggested soft engineering works



Appendix 5

Condition mapping symbols





Weeds

Symbol	Common name	Scientific name
✂	Weed wattles	<i>Acacia spp.</i>
	Giant reed	<i>Arundo donax</i>
⊕	Canna lily	<i>Canna spp.</i>
*	Pampas grass	<i>Cortaderia selloana</i>
●	Perennial veldtgrass	<i>Ehrharta calycina</i>
⊕	African lovegrass	<i>Eragrostis curvula</i>
C	Coral tree	<i>Erythrina x sykesii</i>
7	Edible fig tree	<i>Ficus spp.</i>
Z	Cotton bush	<i>Gomphocarpus fruticosus</i>
△	One leaf cape tulip	<i>Homeria flaccida</i>
☞	Morning glory	<i>Ipomoea spp.</i>
⊞	Lantana	<i>Juncus microcephalus</i>
⊞	Lantana	<i>Lantana camara</i>
▣	Bridal creeper	<i>Myrsiphyllum asparagoides</i>
∞	Paspalum	<i>Paspalum spp.</i>
◆	Castor oil bush	<i>Ricinus communis</i>
#	Blackberry	<i>Rubus fruticosus</i>
Y	Willow	<i>Salix spp.</i>
●	Japanese pepper	<i>Schinus terebinthifolia</i>
S	Deadly nightshade	<i>Solanum nigrum</i>
∞	Nasturtium	<i>Tropeolum spp.</i>
★	Bulrush	<i>Typha orientalis</i>
I	Vetch	<i>Vicia sativa</i>
∞	Watsonia	<i>Watsonia bulbifera</i>
⊗	Arum lily	<i>Zantedeschia aethiopica</i>

Native Species

Symbol	Common name	Scientific name
Al	Swamp peppermint	<i>Agonis linearifolia</i>
As	Coojong	<i>Acacia saligna</i>
Ba	Slender banksia	<i>Banksia attenuata</i>
Bj	Bare twigrush	<i>Baumea juncea</i>
Ca	Tall sedge	<i>Carex appressa</i>
Cc	Marri	<i>Corymbia calophylla</i>
Er	Flooded gum	<i>Eucalyptus rudis</i>
Hc	Native wisteria	<i>Hardenbergia comptoniana</i>
Jp	Pale rush	<i>Juncus pallidus</i>
Js	Green stinkwood	<i>Jacksonia stembergiana</i>
Kp	Running postman	<i>Kennedia prostrata</i>
Li	Pithy sword-sedge	<i>Lepidosperma longitudinale</i>
Lt	Angle sword-sedge	<i>Lepidosperma tetraquetrum</i>
Mr	Swamp paperbark	<i>Melaleuca raphiophylla</i>
Oi	Narrow-leaved Oxylobium	<i>Oxylobium lineare</i>
Pe	Bracken fern	<i>Pteridium esculentum</i>
Vj	Swishbush	<i>Viminaria juncea</i>

Cadastral and Streetsmart data supplied by the Dept. of Land Administration (1998)

Map Legend