



FORESHORE ASSESSMENT IN THE JANE BROOK CATCHMENT



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2001



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Foreshore assessment in the Jane Brook Catchment

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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.



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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 Jane Brook Catchment Group for this second stage of surveys, were as follows:



Table 1: Jane Brook catchment selected sites

Site No	Location	Situated
1	Jane Brook	Reid Highway
2	Jane Brook	West of Great Northern Highway
3	Strelley Brook	East Great Northern Highway – confluence with Jane Brook
4	Strelley Brook	Toodyay Road
5	Mahogany Creek	East of Clare Road
6	Falls Park	Park Road
7	Brookside Park	Johnson Road/Seabome Street
8	Clutterbuck Creek	Parkerville Children's Home - Kilburn Road
9	Clutterbuck Creek	Rowland Road – north of Parkerville
10	Clutterbuck Creek	Beacon Road
11	Bugle Tree Creek	Kintore Road & Riley Road
12	Bugle Tree Creek	Gill Street & Clifton Road
13	Rocky Gully Creek	Alice Road
14 <i>Not surveyed – access difficulties</i>	<i>Mahogany Creek</i>	<i>East of Clare Road</i>

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 Jane Brook Catchment

Jane Brook passes through State forest, rural, special rural and residential areas and has varying levels of pressures from activities such as recreation and agriculture. There has been some interference with the Brook and its tributaries, which is impacting on the Brook health. There are some sections of the waterways that are subject to management practices that are impacting negatively on river health.

Foreshore restoration activities are underway within the catchment. These activities are focussing on revegetation and bank stabilisation.

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 within the Jane Brook catchment to varying degrees. These foreshores are often prone to erosion due to a lack of foreshore vegetation.

Severe erosion is occurring along the banks of a tributary of Clutterbuck Creek (Site 10), where the bank stability has been rated as Very Poor (Black). The creek at this site is an incised channel flowing through a pastured paddock. There is no fringing native vegetation remaining to offer any protection to the banks of the creek from destabilisation due to high water flows and indiscriminate trampling from stock that freely access the site.

The highest rating for bank stability surveyed in Stage 2 was along a tributary of Clutterbuck Creek (Site 9). Due to the density of fringing vegetation, which has aided in the maintenance of bank stability, the site was rated as Good (Green) in terms of bank stability.

3.2 Vegetation

The foreshore vegetation along the majority of the surveyed tributaries in the Jane Brook catchment were rated as Very Poor (Black) to Moderate (Yellow) condition with only two sites rated as Good (Green). These low ratings reflect the degree of disturbance that has occurred to the original vegetation of the area. The

disturbance factors that are most prevalent within the surveyed sites include weed invasion, physical disturbance through trampling and grazing of stock and the clearing of vegetation for residential developments. Further impact on the vegetation is caused by the apparent high recreational use of these foreshore areas. Indiscriminate access by walkers is causing the trampling of vegetation even in areas with clearly defined walk trails.

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 the local fauna with a range of suitable habitats, is often deep rooted and is therefore better at supporting the banks of the waterway and preventing the onset of bank destabilisation. Native plant communities are also less likely to block waterways (Pen 1999).

The overstorey within the riparian zones of the Jane Brook catchment is characterised by native tree species including *Corymbia calophylla* (Marri), *Melaleuca raphiophylla* (Swamp Paperbark), *Eucalyptus marginata* (Jarrah), *E. laeliae* (Darling Range Ghost Gum), *E. rudis* (Flooded Gum) and *E. wandoo* (Wandoo).

The more common middlestorey native species of this catchment include *Hakea lissocarpa* (Honeybush), *Hypocalymma angustifolium* (White Myrtle), *Acacia pulchella* (Prickly Moses), *A. saligna* (Coojong), *Agonis linearifolia* (Swamp Peppermint), *Astartea fascicularis* (Common Astartea), *Hakea amplexicaulis* (Prickly Hakea), *Trymalium ledifolium*, *Viminaria juncea* (Swishbush), *Xanthorrhoea preissii* (Grass Tree) and *Dryandra sessilis* (Parrot Bush).

A moderate diversity of understorey species was recorded along a number of foreshore locations. Common species include *Juncus pallidus* (Pale Rush), *Lepidosperma scabrum*, *L. gracile*, *L. tenue*, *Acacia alata* (Winged Wattle), *Macrozamia reidleyi* (Zamia), *Pimelea rosea* (Rose Banjine), *Stylidium* spp. (Trigger



Plants), *Hardenbergia comptoniana* (Native Wisteria), *Hovea trisperma* (Common Hovea), *Baumea juncea* (Bare Twig Rush) and *Schoenus grandiflorus* (Large Flowered Rush). *Andersonia lehmanniana*, *Cryptandra arbutiflora* (Waxy Cryptandra), *Dryandra nivea* (Couch Honey-pot), *Grevillea bipinnatifida* (Native Fuchsia), *Baeckea camphorosmae* (Camphor Myrtle), *Hibbertia spicata* (Yellow Buttercups), *Hovea chorizemifolia* (Holly-Leaved Hovea) and *Leucopogon* spp. also occur. *Mesomelaena pseudostygia* and a range of dryland members of the families Cyperaceae and Restionaceae are common.

3.2.2 Weeds

Within the overstorey, weed species included introduced Wattles (*Acacia* spp.), Edible Figs (*Ficus carica*) and a species of Willow (*Salix* sp.). Exotic deciduous trees, such as those mentioned are common along degraded foreshores in urbanised areas, and have also spread into the neighbouring rural areas. These trees were originally planted as ornamentals or appear to have escaped from nearby gardens. Deciduous trees threaten foreshore health as sudden leaf fall during winter decreases available stream cover and often introduces large amounts of organic matter into the water column. The breakdown of large amounts of soft leaves may cause a sudden decline in the amount of available oxygen in the water column, affecting instream organisms. This can constitute a form of organic pollution.

All of the overstorey weed species constitute a significant threat to the waterways and neighbouring bushland. Introduced Wattles are becoming increasingly widespread throughout the Scarp region, and are considered difficult to manage by many local government authorities, state agencies and community groups.

Weeds in the middlestorey often form dense stands in clumps or in narrow strips along the edge of the watercourse. The most frequent weeds forming dense stands within some of the sections surveyed include Tagasaste (*Cytisus proliferus*), Giant Reed (*Arundo donax*), introduced Bulrush (*Typha orientalis*) and Blackberry (*Rubus fruticosus*).

The understorey weed species most commonly encountered within the Jane Brook catchment were Watsonia (*Watsonia bulbifera*), Bridal Creeper (*Asparagus asparagoides*), Fleabane (*Conyza* spp.), Kikuyu (*Pennisetum clandestinum*), Guildford Grass (*Romulea rosea*), Dock (*Rumex* spp.), *Phalaris* sp. and Soursob (*Oxalis pes-caprae*).

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 cover and permanent shade along a waterway. Instream emergent and submerged vegetation, rocks and logs provide cover for aquatic organisms.

Within the sites surveyed in the Jane Brook catchment the stream cover varied from a rating of Very Poor (Black) to Excellent (Blue). Along a tributary of Clutterbuck Creek (Site 10) the only vegetation present is grazed pasture grasses, which provide no stream cover. There is also an absence of instream features and as a consequence this site was rated as Very Poor (Black). In contrast to this, the stream cover along another section of Clutterbuck Creek (Site 9) was rated as Excellent (Blue) due to the abundance of *Agonis linearifolia* (Swamp Peppermint) fringing the creekline resulting in almost continuous, thick cover along the length of this site. Further, the presence of instream features, such as leaf litter and branches provide abundant instream cover for aquatic organisms.

3.4 Habitat diversity

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. Healthy, diverse streamside vegetation provides suitable habitats for terrestrial organisms and overstorey trees provide roosting and nesting sites for birds.



The habitat diversity offered by the sites surveyed within the Jane Brook catchment varied from a rating of Moderate (Yellow) to Very Poor (Black). Rocky Gully Creek (Site 13, Section B) is one of the few surveyed sites which exhibits a Moderate level of habitat diversity. The presence of a diversity of vegetation, variation in aquatic habitat and some permanence of water within dams maintains diverse habitats for a variety of aquatic and terrestrial organisms.

Clutterbuck Creek (Site 10) habitat diversity was rated as Very Poor (Black). The lack of fringing vegetation, absence of instream features and transient nature of the water creates minimal habitat diversity for terrestrial or aquatic fauna.

The presence or absence of permanent water is a defining feature of an Excellent (Blue) habitat 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. As a consequence this often results in the downgrading of many sites where the permanence of water is uncharacteristic. Therefore, in some circumstances, it maybe useful to reduce the weighting of this character when the headwaters of a catchment are surveyed.

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 Jane Brook

Summary of river health: Site 1 Jane Brook west of Great Northern Highway

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

Stream Condition
Red
Poor
12

Summary of river health: Site 2 Jane Brook east of Great Northern Highway

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

Stream Condition
Red
Poor
12

3.5.2 Summary results for Strelley Brook

Summary of river health: Site 3 Strelley Brook

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 4 Strelley Brook

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

3.5.3 Summary results for Mahogany Creek**Summary of river health: Site 5 Mahogany Creek**

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

Stream Condition
Yellow
Moderate
18

3.5.4 Summary results for Falls Park**Summary of river health: Site 6 – Section A – Falls Park**

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

Stream Condition
Red
Poor
10

Summary of river health: Site 6 – Section B – Falls Park

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

3.5.5 Summary results for Brookside Park**Summary of river health: Site 7 Brookside Park**

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

Stream Condition
Red
Poor
12



3.5.6 Summary results for Clutterbuck Creek

Summary of river health: Site 8 Clutterbuck Creek

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

Stream Condition
Yellow
Moderate
14

Summary of river health: Site 9 Clutterbuck Creek

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Green	Green	Blue	Yellow
Good	Good	Excellent	Moderate
6	6	8	4

Stream Condition
Green
Good
24

Summary of river health: Site 10 Clutterbuck Creek

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

Stream Condition
Black
Very Poor
0

3.5.7 Summary results for Bugle Tree Creek

Summary of river health: Site 11 – Section A – Bugle Tree Creek

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Red	Yellow	Green	Yellow
Poor	Moderate	Good	Moderate
2	4	6	4

Stream Condition
Yellow
Moderate
16

Summary of river health: Site 11 – Section B – Bugle Tree Creek

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

Stream Condition
Red
Poor
6



Summary of river health: Site 12 – Section A – Bugle Tree Creek

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 12 – Section B – Bugle Tree Creek

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Red	Red	Green	Green
Poor	Poor	Good	Good
2	2	6	6

Stream Condition
Yellow
Moderate
16

3.5.8 Summary results for Rocky Gully Creek**Summary of river health: Site 13 – Section A – Rocky Gully Creek**

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

Stream Condition
Red
Poor
10

Summary of river health: Site 13 – Section B – Rocky Gully Creek

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

Stream Condition
Yellow
Moderate
14





4. Specific site reports

4.1 Jane Brook

Reid Highway

Results

Foreshore Condition Survey

A Study undertaken on behalf of

Water and Rivers Commission and the Natural Heritage Trust



Jane - Site 1: Map 1 Jane Brook

Length of section (m): 460 m
 Recorder's name: B Waining and N Siemon
 Date surveyed: 21/6/99
 Nearest road access: Reid Highway
 Lot number(s): 2

Summary of river health:

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

Stream Condition
Red
Poor
12

Description

Bank stability: This section of Jane Brook runs north from its confluence with the Swan River. It exhibits significant levels of erosion and slumping of the banks, with localised areas of sedimentation. The channel is up to 4 m wide with steep banks $>60^\circ$ and up to 90° . The bank height is variable with a maximum reaching 2.5 m. There is some undercutting of the banks occurring, predominantly on the outer bends of the brook. The brook is fenced to prevent uncontrolled stock access, however there is some evidence of stock movement along the banks and in the creek bed.

Vegetation: The riparian vegetation has been reduced to a very narrow strip, comprising only native overstorey and weed understorey species, with no significant middlestorey vegetation observed. The overstorey cover is continuous and dominated by frequent *Eucalyptus rudis* (Flooded Gum) and *Melaleuca raphiophylla* (Swamp Paperbark). *E. wandoo* (Wandoo) and *Acacia saligna* (Coojong) are present but are uncommon. There is little or no regeneration of any of these species. The understorey is continuous and is exclusively composed of weed species, in particular annual grasses and pasture

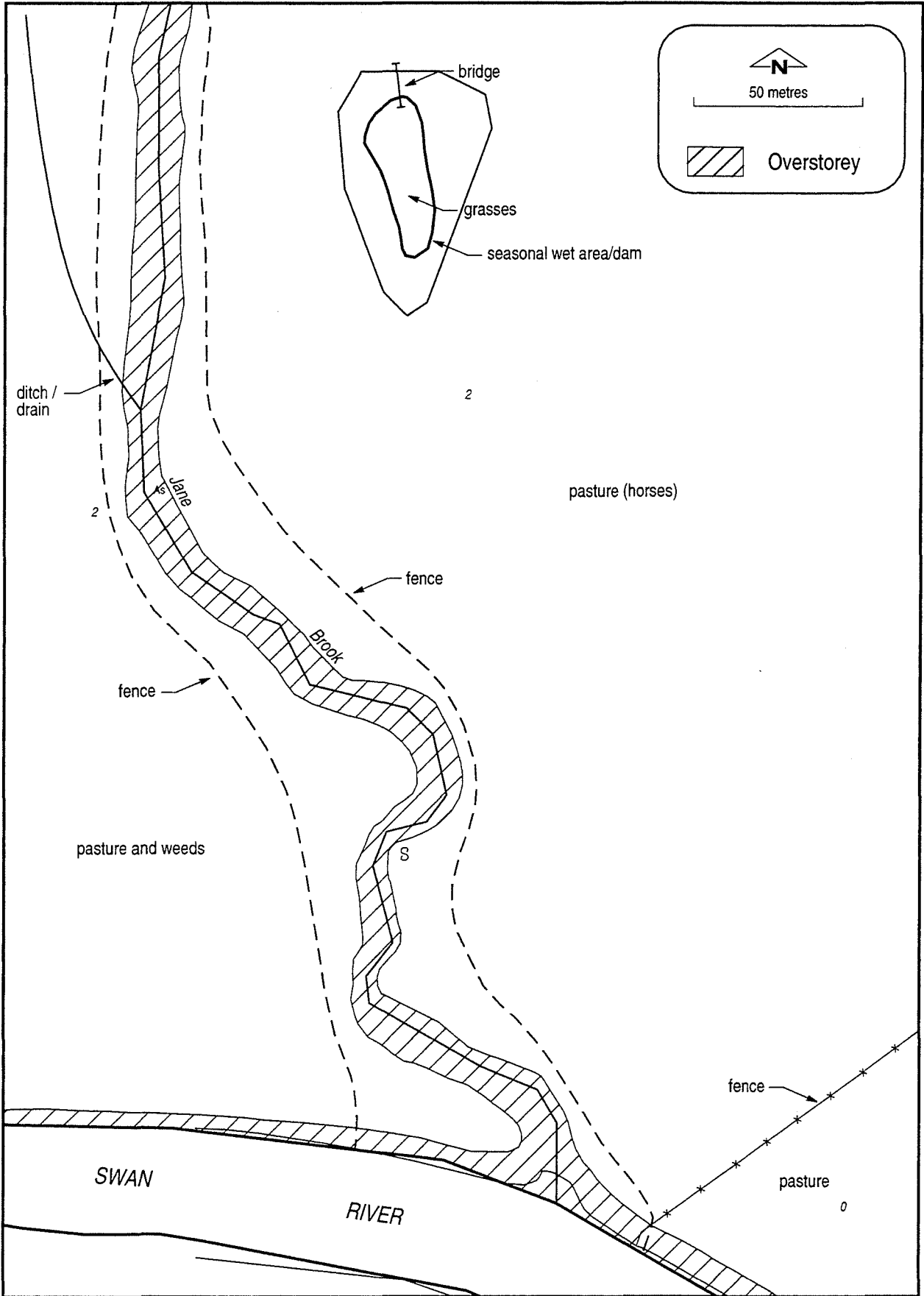
Recommended Strategies

- Liaise with the landholder to ensure stock is excluded from the foreshore area through effective fence maintenance and stock management.
- Establish offline stock watering points.
- Undertake soft engineering works on the most severe areas of erosion in accordance with suggested strategies provided in Appendix 4.
- Encourage the Water and Rivers Commission to investigate the hydrology of the brook, and develop strategies to protect the powerbends from increased degradation occurring during peak flow events.
- Increase the extent and diversity of fringing vegetation using appropriate species recommended in Appendix 3.
- Increase the extent of fringing vegetation, using plant species representative of all levels of the vegetative complex (Appendix 3) to protect the remaining remnants from dying out.
- Ensure effective exclusion of stock from the foreshore zone.
- Undertake weed control, ensuring that any works do not impact detrimentally on bank stability (Appendix 2).
- Hand weed or brushcut Dock, Fleabane and Thistles while flowering to prevent seed production and further weed invasion.



<p>species. Also present within the understorey are infrequent occurrences of Dock (<i>Rumex</i> spp.), Fleabane (<i>Conyza</i> spp.), Thistles (<i>Centaurea</i> spp.) and Kikuyu (<i>Pennisetum clandestinum</i>).</p>	<ul style="list-style-type: none"> • Undertake Kikuyu control, which will require spot treatments of occasional occurrences with Fusilade at recommended application levels (Appendix 2).
<p>Stream Cover: There is frequent stream cover offered by the fringing native overstorey vegetation. Overhanging eucalypts and paperbarks provide permanent areas of shade within the stream. Instream branches and some vegetation, predominantly Kikuyu, are evident, however there are no rocks and very little leaf litter limiting the overall instream cover.</p>	<ul style="list-style-type: none"> • Increase the amount of fringing vegetation along the stream section using appropriate native species. • Revegetate the instream environment and immediate banks, using native rushes and sedges. • Establish upstream riffle structures to protect plantings from peak flows. • Retain instream features such as branches and logs that do not exacerbate erosion.
<p>Habitat diversity: Water depth within this section is consistent at approximately 0.4 m, increasing in depth at the confluence with the Swan River. The water is slightly turbid and tannin stained. Wildlife observed included ducks, frogs and a variety of birds. The vegetation does provide some habitat in the form of protected basking sites for invertebrates and reptiles. The trees provide nesting and roosting sites for birds. The stream itself contains some meanders and pools providing a diversity of habitats for aquatic organisms.</p>	<ul style="list-style-type: none"> • Retain instream features either in situ or arranged in a manner which results in the creation of equivalent riffle structures. • Control sediment entering the waterway, to reduce sediment load and turbidity, by stabilising the banks of the brook. • Revegetate the area to provide adequate cover and diversity of vegetation types for a wider range of habitats.
<p>Other issues: A shallow drainage channel entering the waterway may be a source of nutrients, sediment and other pollutants draining from the adjacent paddock. Grazing pressures from stock, in this case horses, may be responsible in part for the lack of regeneration of plant species present and also the lack of middlestorey and understorey species.</p>	<ul style="list-style-type: none"> • Investigate the source of drainage water entering the waterway via the shallow drain. • Liaise with the landholder to ensure paddocks are not overstocked and that grazing pressure is managed. • Encourage the landholder to develop strategies to trap faecal material onsite to reduce discharge into the brook.





Jane Brook - Reid Highway Site 1 - Map 1



4.2 Jane Brook

West of Great Northern Highway

Results

Foreshore Condition Survey

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



Jane – Site 2: Maps 1-2 Jane Brook

Length of section (m): 1020 m
Recorder's name: B Waining and N Siemon
Date surveyed: 15/6/99
Nearest road access: Great Northern Highway
Lot number(s): 69

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: Where Jane Brook passes beneath the Great Northern Highway, the banks exhibit significant levels of erosion and localised areas of sedimentation and slumping. The brook has very steep banks (>60°). The channel is approximately 3 m wide and 1.5 – 2 m deep. There are no artificial stabilisation structures. Severe erosion and slumping is occurring frequently around the outer bends of the brook. Stock can freely access the foreshore area, which has resulted in further bank destabilisation.

Vegetation: The diversity of vegetation within the foreshore zone of the brook is poor. The overstorey is continuous, but exists as a narrow fringe only. The dominant species within the overstorey include frequent *Eucalyptus rudis* (Flooded Gum) and *Melaleuca raphiophylla* (Swamp Paperbark). Exotic species within the overstorey include occasional Edible Figs (*Ficus carica*) and Japanese Pepper Trees (*Schinus terebinthifolia*). The middlestorey is very sparse, with only occasional occurrences of *Acacia saligna* (Coojong), *A. pulchella* (Prickly Moses) and *Trymalium ledifolium*. The understorey

Recommended Strategies

- Investigate the need for remedial works beneath the bridge to ensure that the infrastructure is not threatened.
- Undertake soft engineering works, where applicable, to aid in bank stabilisation (Appendix 4).
- Liaise with the landholder to encourage the re-alignment of fences to exclude stock from the brook and install offline watering points.
- Ensure that any removal of weed species, does not result in further degradation of the foreshore.
- Revegetate the foreshore fringe following weed control works, with all strata of native vegetation selected from Appendix 3.
- Re-align fencing to exclude stock.
- Handweed Dock prior to flowering and dispose of appropriately.
- Inject Edible Fig and Japanese Pepper with systemic poison and when dead, remove the above ground material from the area ensuring that the foreshore banks are not destabilised.
- Monitor for any suckers or regeneration of the exotic trees and spray any juvenile plants with a systemic herbicide in accordance with the suggested methodology (Appendix 2).



is continuous, however it is dominated by weed species. These include a dominant occurrence of pasture species and frequent occurrences of *Watsonia bulbilifera*, especially close to the bridge at Great Northern Highway. *Phalaris* spp., *Paspalum* spp., Dock (*Rumex* spp.) and Soursob (*Oxalis pes-caprae*) are also present.

Stream cover: There is frequent stream cover provided by the fringing native overstorey vegetation. However, deciduous exotic species such as Edible Figs provide only occasional cover and seasonal shade. Within the brook, leaf litter, branches and vegetation are present maintaining a level of instream cover.

Habitat diversity: The water depth within the brook is relatively consistent at around 0.6 m and is possibly permanent. Suspended sediment is present in the water column resulting in discolouration. The poor vegetation diversity provides limited habitat for terrestrial animals. There are some protected areas for basking reptiles and invertebrates amongst the leaf litter and logs. The trees provide suitable habitat for nesting and roosting birds.

Other issues: Grazing, although helping control the spread of *Watsonia*, is preventing natural regeneration of native plants. There are a number of stock access and crossing points within the foreshore area. Small amounts of rubbish were also observed along the survey section.

- Brushcut 2 m diameter circles in the annual grasses and install a weed suppression material such as hemp or deep mulch, and plant tubestock using appropriate native species (Appendix 3).

- Repeatedly brushcut *Watsonia*, *Phalaris*, *Paspalum* and Soursob prior to flowering to enable a measure of control and reduce the fire hazard.

- Work to undertake revegetation within the main channel of the brook using native rushes and sedges, ensuring that any plantings are pegged into the substrate to protect them from being washed away in peak flows.

- Retain instream cover features, such as logs and fallen branches – arranging them so that they do not exacerbate erosion of the banks.

- Revegetate the instream environment with appropriate native rushes and sedges (Appendix 3).

- Remove exotic trees from along the brook (Appendix 2).

- Liaise with the Water and Rivers Commission to help investigate the source of instream sediment loads. This requires an assessment of the entire catchment followed by determination of suitable techniques to control the load.

- Implement localised weed control and revegetation at a manageable scale.

- Revegetate the instream channel with appropriate rushes and sedges (Appendix 3).

- Retain instream habitat features, such as logs and branches.

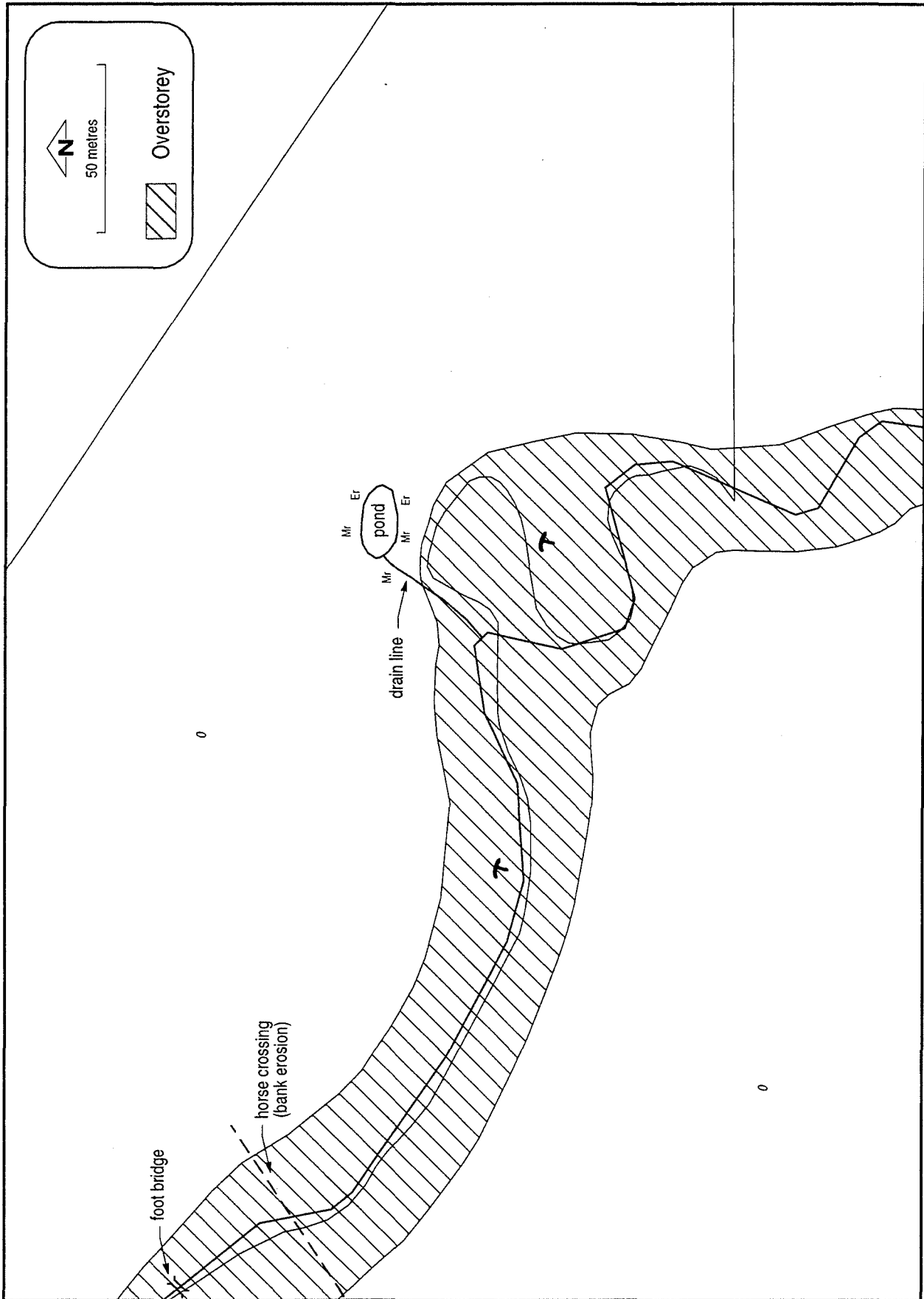
- Liaise with the landholder to encourage the control of grazing and horse access to the foreshore through fence re-alignment and creation of offline watering points.

- Focus on controlling the *Watsonia* once stock grazing is minimised.

- Investigate the source of rubbish and control influx if possible.

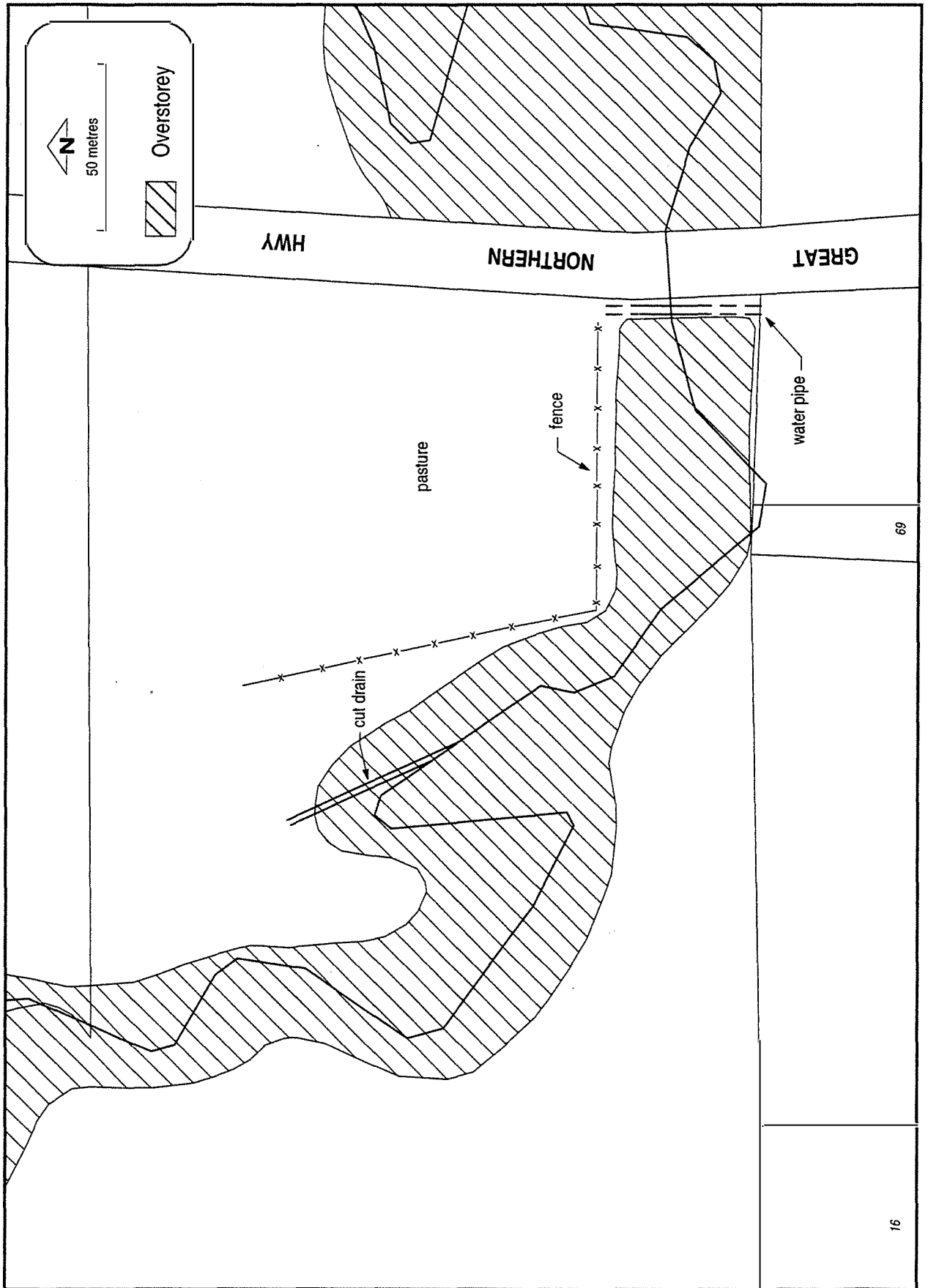
- Encourage landholders to become more actively involved in foreshore management to achieve conservation purposes.





Jane Brook - West of Great Northern Highway Site 2 - Map 1





Jane Brook - West of Great Northern Highway Site 2 - Map 2





4.3 Strelley Brook

East of Great Northern Highway

Results

Foreshore Condition Survey

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



Jane – Site 3: Maps 1-3 Jane Brook

Length of section (m): 1500 m
 Recorder's name: B Waining
 Date surveyed: 15/6/99
 Nearest road access: Great Northern Highway
 Lot number(s): 24, 23

Summary of river health:

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

Description

Bank stability: The foreshore banks of this section of Jane Brook (Site 3) range from very shallow grades of 0-10° to very steep banks (>60°). Along the steep foreshore banks the main channel is incised and is up to 1.5 m in both width and depth. Localised areas of erosion, slumping and sedimentation are evident. The shallow sloped banks occur as the channel widens into wetland areas within the central and northern sections of the site. Erosion and slumping are less common within the wetland areas, however sedimentation increases.

Vegetation: The vegetation of this site comprises a continuous overstorey and understorey, with a sparse middlestorey. The overstorey consists of up to 90% native tree species including frequent *Eucalyptus rudis* (Flooded Gum) and abundant *Melaleuca raphiophylla* (Swamp Paperbark). There are also occasional to frequent exotic trees including Japanese Pepper (*Schinus terebinthifolia*) and Edible Fig (*Ficus carica*). Isolated occurrences of *Acacia saligna* (Coojong) are present in the middlestorey. The non-native component of the middlestorey is limited to a few occurrences of the introduced Bulrush (*Typha orientalis*). The understorey is dominated by weed species. The only native understorey species sighted was occasional *Acacia pulchella* (Prickly Moses)

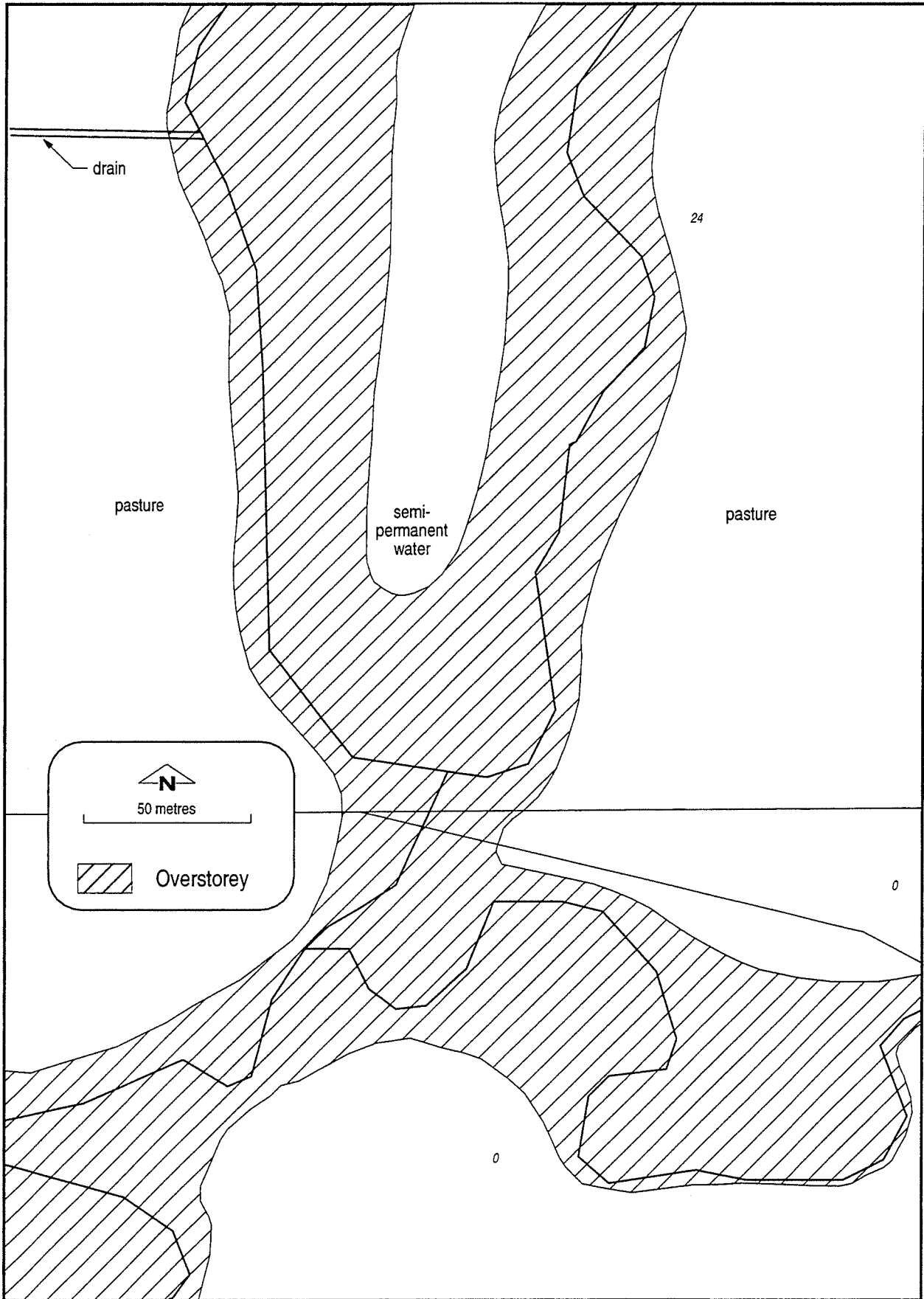
Recommended Strategies

- Implement engineering works upstream of the eroded sites, using riffles to slow the water flow, in accordance with river restoration techniques (Appendix 4).
- Consolidate the banks surrounding the wetland areas, to prevent further sediment additions to the waterway.
- Liaise with the Water and Rivers Commission to help trace the source of sediment and implement techniques, where appropriate, to control the sediment load.
- Focus weed control works on *Watsonia* to reduce the fire hazard and spread of this highly invasive weed using techniques outlined in Appendix 2.
- Revegetate the area using appropriate locally derived native species, from all levels of the vegetative structure (Appendix 3).
- Hand weed or selectively spray around any native plant seedlings and persistent remnant plants.
- Poison and remove the exotic trees (Edible Fig and Japanese Pepper) from the foreshore ensuring that their root systems remain intact to prevent further bank destabilisation (Appendix 2).



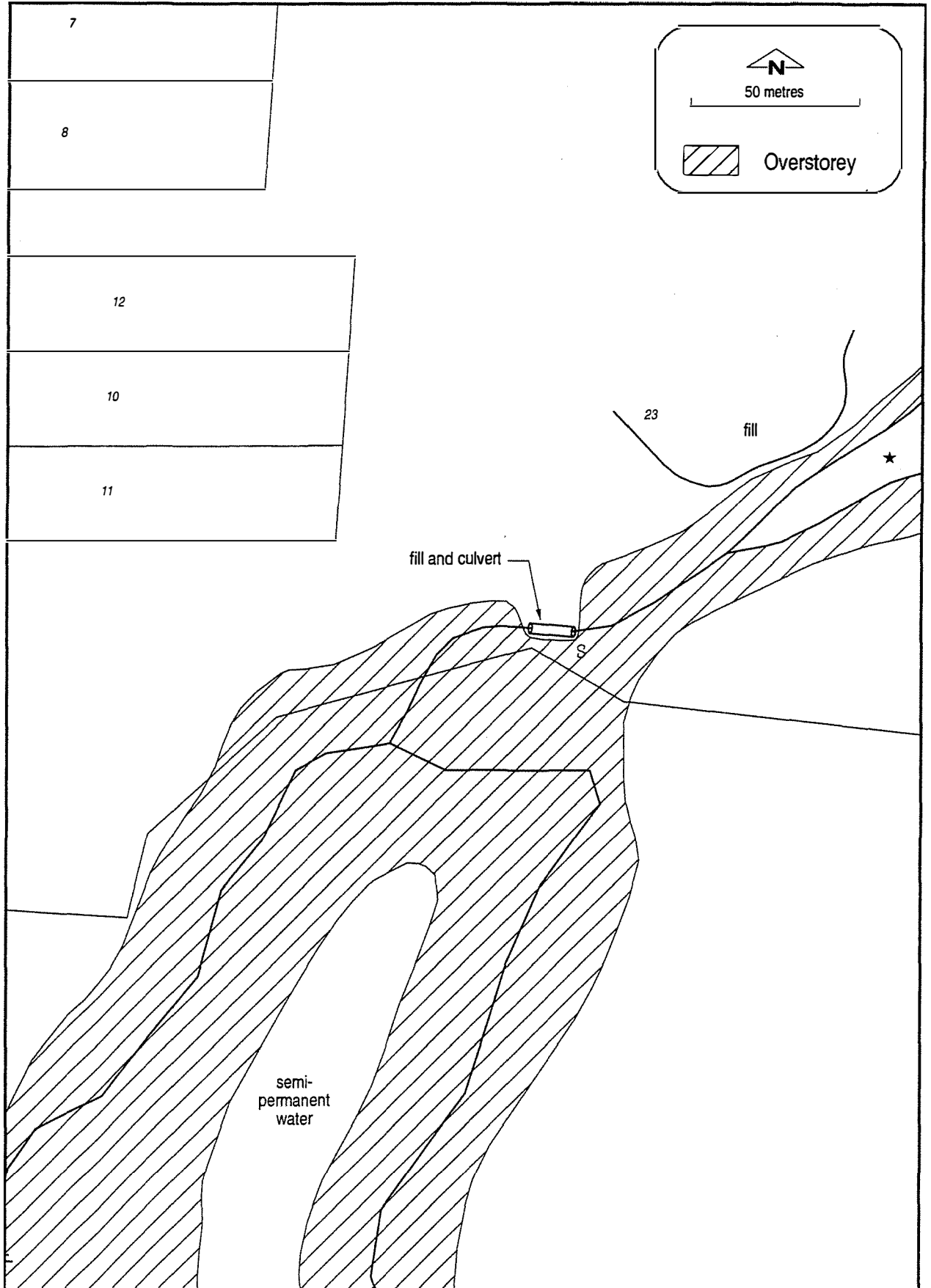
<p>The dominant weed species include <i>Watsonia</i> (<i>Watsonia bulbifera</i>), Fleabane (<i>Conyza</i> spp.), Dock (<i>Rumex</i> spp.), <i>Phalaris</i> spp. and Soursob (<i>Oxalis pes-caprae</i>).</p>	<ul style="list-style-type: none"> • Extend the distribution of the isolated patches of rushes and sedges using recommended native species. • Remove seed heads from the introduced Bulrush prior to ripening and brushcut in May to prevent this species from spreading further.
<p>Stream Cover: Abundant native vegetation along the foreshore maintains adequate stream cover. There is also a frequent occurrence of exotic vegetation providing cover to the stream channel, however deciduous trees maintain only seasonal protection. Some leaf litter, branches and vegetation provide instream cover for aquatic organisms.</p>	<ul style="list-style-type: none"> • Replace exotic vegetation fringing the stream, with appropriate native species (Appendix 3). • Retain instream cover features within the stream where there is no threat to bank stability.
<p>Habitat diversity: It is uncertain if there is permanent water within this section. The wetlands appear to be seasonally inundated. Water was present and flowing within the brook at the time of survey to a depth of approximately 0.3 m. The trees within the section provide basking sites for invertebrates and reptiles and nesting or roosting sites for birds. Instream habitats are augmented by the presence of meanders and instream logs and debris. The only species of plant providing dense cover in the floodplain is <i>Watsonia</i>.</p>	<ul style="list-style-type: none"> • Remove weed species and replace with an appropriate selection of native plant species (Appendix 3). • Retain instream habitat features. • Ensure <i>Watsonia</i> control works are undertaken in nodes, with immediate high-density plantings of native species, to ensure that there is continuity of habitat for fauna.
<p>Other issues: This area contains large amounts of rubbish, including old tyres strewn around the wetland areas. Considerable landfill has been deposited at the northern end of this section. The fill extends from the sawmilling property into the wetlands. This has created an unnatural hydrological barrier in the centre of the wetland and to the northern extent of the wetland.</p>	<ul style="list-style-type: none"> • Approach the Department of Environmental Protection and the Water and Rivers Commission to monitor water quality, to determine any seepage of toxins from the landfill and sawmill operations. • Remove rubbish from the site. • Contact the Water and Rivers Commission to determine if an investigation of the hydrological disruption caused by the landfill can be undertaken.





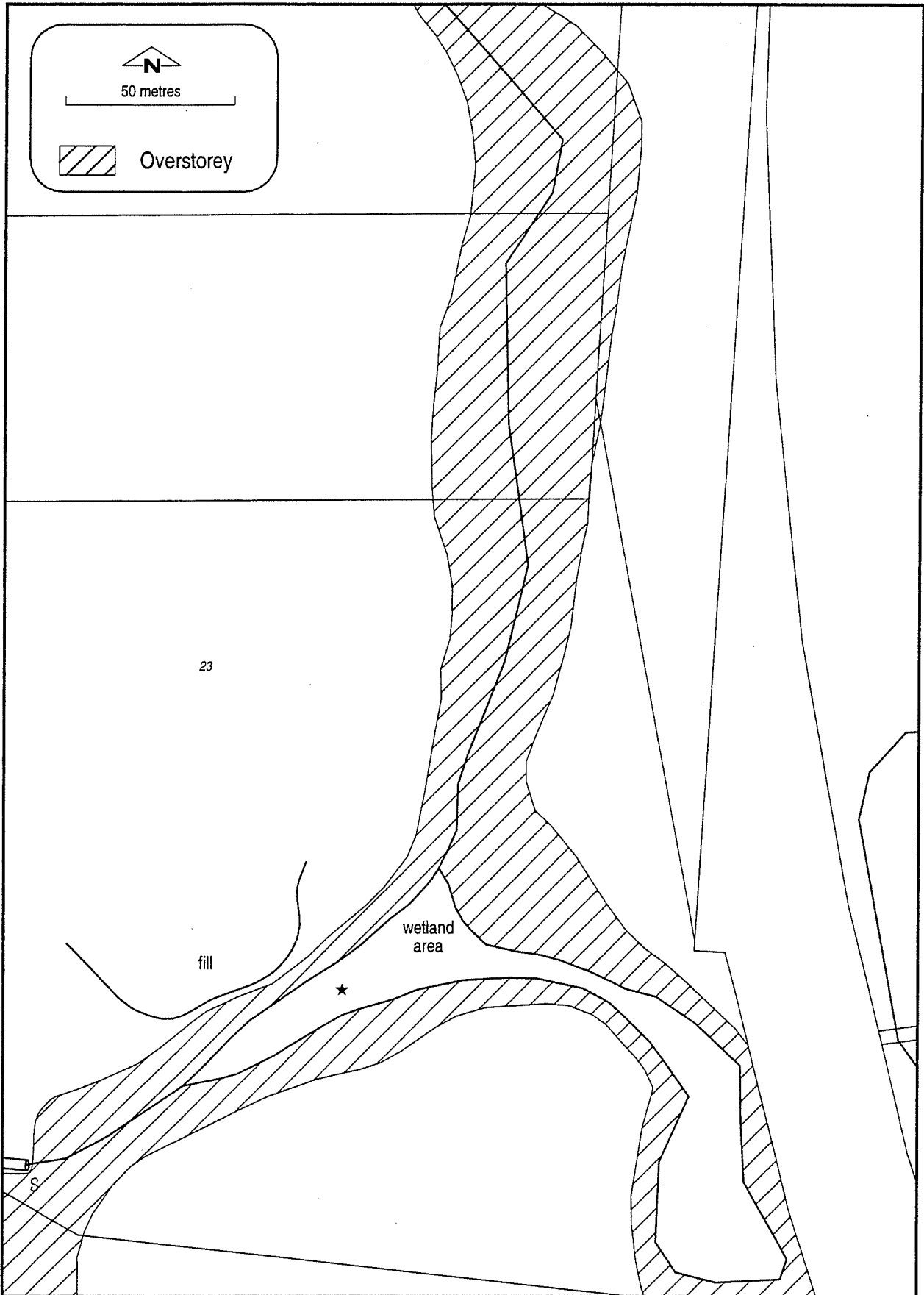
Strelley Brook - East of Great Northern Highway Site 3 - Map 1





Strelley Brook - East of Great Northern Highway Site 3 - Map 2





Strelley Brook - East of Great Northern Highway Site 3 - Map 3



4.4 Strelley Brook

Toodyay Road

Results

Foreshore Condition Survey

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



Jane – Site 4: Maps 1-2 Strelley Brook

Length of section (m): 1080 m
 Recorder's name: N Siemon
 Date surveyed: 13/6/99
 Nearest road access: Toodyay Road
 Lot number(s): 11664

Summary of river health:

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Green	Green	Green	Blue
Good	Good	Good	Excellent
6	6	6	8

Stream Condition
Green
Good
26

Description

Bank stability: Strelley Brook (Site 4) flows from Red Hill into Jane Brook. The channel meanders beneath Toodyay Road, through extensive granite outcrops and a narrow channel across the face of the Scarp. The main channel varies in width from 6 m wide at the natural granite spillways to less than a metre for the remainder. The depth ranges between 0.5 m and 0.6 m throughout. There are areas of localised scouring, but these are minimal. Coarse sandy sediments have accreted beneath Toodyay Road and on the granite spillways. The banks were stable.

Vegetation: The vegetation along this survey section is relatively healthy, with evidence of fire-related disturbance close to Toodyay Road and some weed invasion. The vegetation is characterised by closed dense shrubland, with an adjoining open overstorey occurring upslope. The middlestorey comprises a mosaic of *Grevillea endlicheriana* (Spindly Grevillea), *Calothamnus sanguineus* (Pindak), *C. quadrifidus* (One Sided Bottlebrush), *Hakea cristata* (Snail Hakea), *Hakea lissocarpa* (Honeybush), occasional *Xanthorrhoea preissii* (Grass Tree) and *Labichea lanceolata* (Tall Labichea). Other species present include *Hibbertia* sp. (Native Buttercups), *Macrozamia reidleyi* (Zamia), *Dryandra nivea* (Couch

Recommended strategies

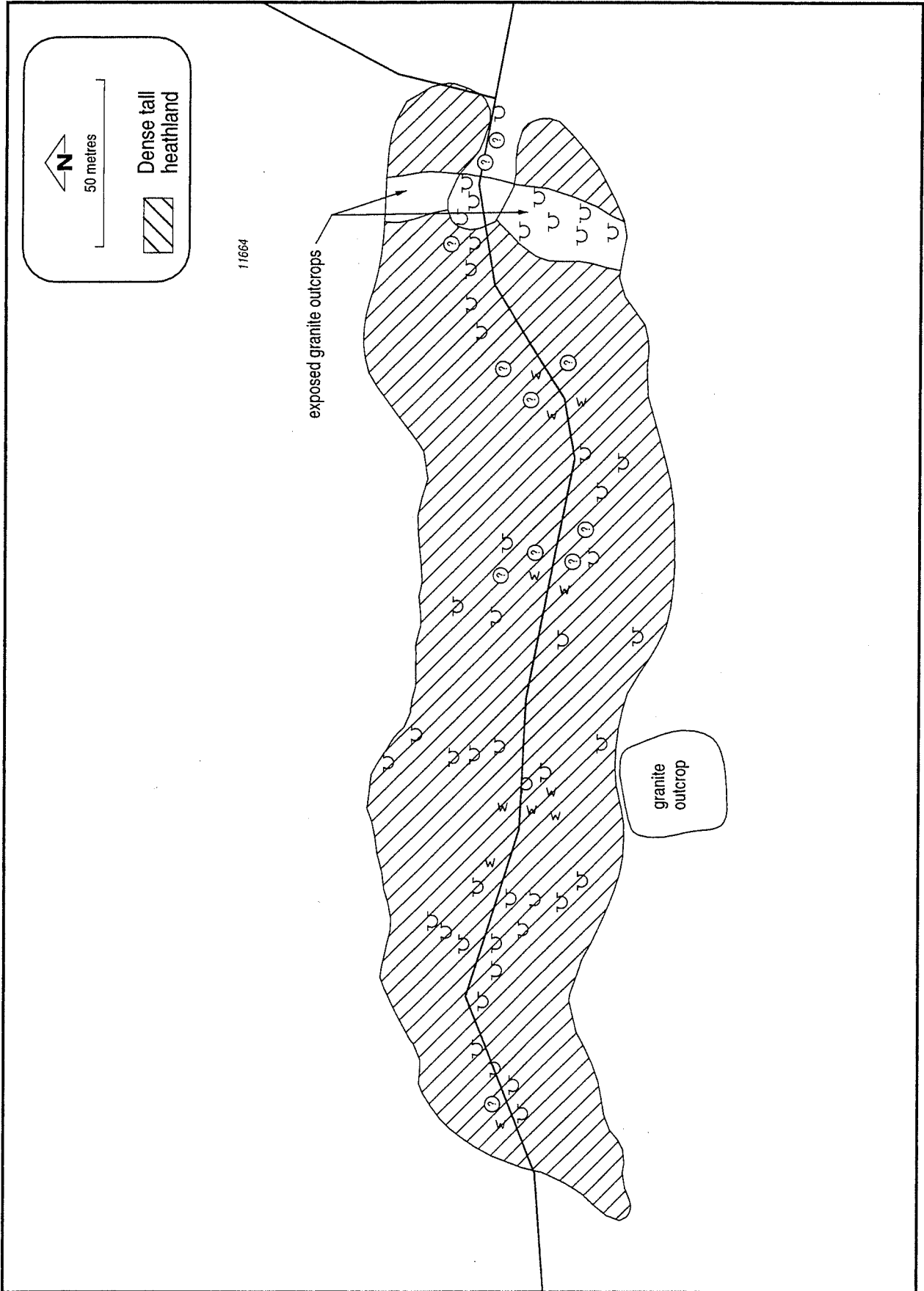
- Liaise with the local government authority, Main Roads WA and the Water and Rivers Commission to encourage the use of Water Sensitive Urban Design principles so that stormwater is contained upslope.
- Approach the Main Roads WA and the local government authority to investigate the possibility of installing a gross pollutant trap immediately downslope of Toodyay Road, and regularly remove coarse sediments.
- Implement localised weed control along the banks ensuring stability is not threatened by any works.
- Implement intensive weed control along the roadside to eradicate sources of weed seed and segments, from this site upstream to the top of the catchment.
- Focus on controlling weed species such as the African Feather Grass, which increase the flammability of the reserve. Seed head removal may be possible.
- Hand weed or selectively paint *Watsonia*, *Medica* and the small herbaceous species with a systemic herbicide to reduce the extent of infestation and reduce their ability to spread (Appendix 2).



<p>Honeyeater) and <i>Darwinia citriodora</i> (Lemon-scented Darwinia). There are also occasional occurrences of <i>Acacia alata</i> (Winged Wattle). Understorey species present include <i>Alexgeorgea arenicola</i>, <i>Borya sphaerocephala</i> and <i>Corynotheca micrantha</i> (Net Bush). Four weed species were noted during the survey. These are African Feather Grass (<i>Pennisetum macrourum</i>), <i>Watsonia</i> (<i>Watsonia bulbilifera</i>), <i>Medicis</i> (<i>Medicago</i> spp.) and a small herbaceous species with pink flowers. It is possible that there are other annuals present which were not apparent during the survey.</p>	<p>Stream cover: Stream cover is patchy due to the proximity of granite boulders to the main stream. The exposed granite provides little cover, however in areas where sediment has accumulated and plants have established cover is good. Vegetation and branches and other organic debris provide instream cover.</p>	<p>Habitat diversity: The diversity of habitats is excellent ranging from exposed granite boulders, through dense shrubland, pool and riffle sequences and dead vegetation. There are considerable basing locations available for reptiles and invertebrates, soft substrate for frogs, dense scrub for echidnas, kangaroos and wallabies and significant areas of nectar-producing species to encourage many birds and invertebrates. Scorpions and other large invertebrates are present beneath rocks adjacent to the brook.</p>	<p>Other issues: Litter was present close to Toodyay Road and there are occasional tyres, drink cans and other debris instream along the length of the stream. There was evidence of a reasonably recent burn. There are a number of walk trails and fire access tracks that have not been aligned across the contours. These are eroding in some areas.</p>
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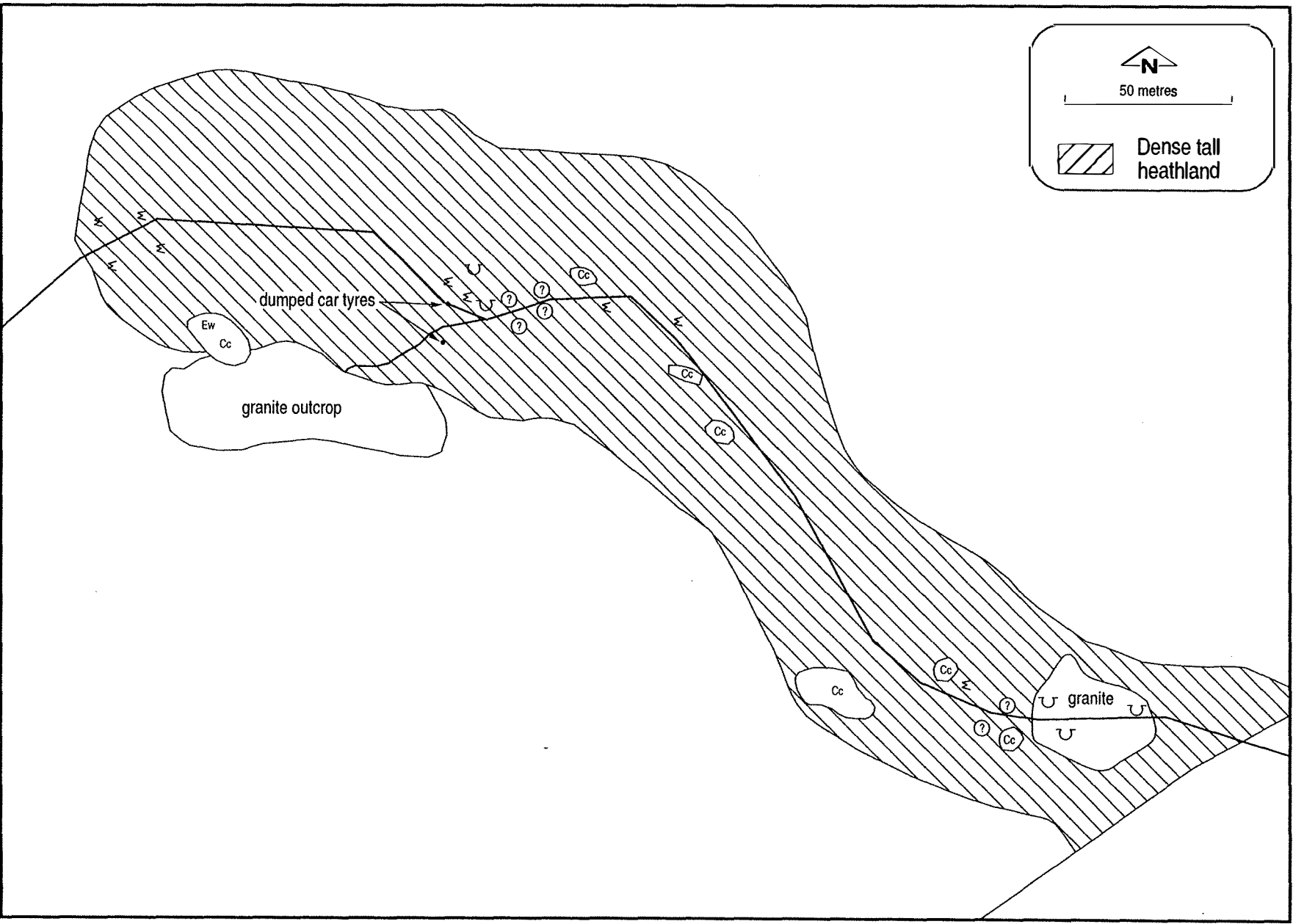
<ul style="list-style-type: none"> • Work with the local government authority to assess the recreational use of the area and define access tracks if required using bollards and woodchip guideways to reduce the amount of indiscriminate trampling of native vegetation. 	<ul style="list-style-type: none"> • Install signage to advise users of the unique values of this area. Include information about why users should keep to the tracks, to help minimise disturbance factors such as indiscriminate walking. Other information could include the fire risk to the area and how to reduce the spread of flammable plants; and information on litter, advising visitors to take their rubbish home. 	<ul style="list-style-type: none"> • Protect the area from fire by ensuring effective weed control close to the road to minimise flammability of the reserve. • Ensure active management of the current low level weed infestations so that the environmental integrity of the area is maintained. • Liaise with the landowner and local government authority to ensure that any prescribed burns (if used in this area) are undertaken in a mosaic pattern to provide sufficient cover and habitat for fauna while the vegetation is regenerating. 	<ul style="list-style-type: none"> • Rationalise the fire access and walk trails and install small runoff banks to trap water. • Liaise with Main Roads WA and the local government authority to undertake regular rubbish removal from the site and ensure bins in the nearby roadside rest areas are emptied frequently. • Remove tyres and other rubbish dumped instream, being careful not to trample vegetation.
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Strelley Brook - Toodyay Road Site 4 - Map 1





Strelley Brook - Toodyay Road Site 4 - Map 2



4.5 Mahogany Creek

Results Foreshore Condition Survey

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



Jane – Site 5: Map 1-2 Mahogany Creek

Length of section (m): 740 m
Recorder's name: B Waining
Date surveyed: 12/7/99
Nearest road access: Hedges Road (east)
Lot number(s): 2185, 1987, 2060, 2187

Summary of river health:

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

Stream Condition
Yellow
Moderate
18

Description

Bank stability: The banks of Mahogany Creek in this section (Site 5) are in relatively good condition, with only localised areas of erosion and sedimentation observed. The extent of bank affected by slumping is minimal. The most severe area of erosion is within the road reserve, which crosses the creek in the central part of the site. This point appears to have been used as a crossing area but does not possess a culvert or similar device to limit potential erosion. The eastern end of the section has the facility for stocking, but contains no fencing to prevent stock access to the creek.

Vegetation: The vegetation complex of this section of Mahogany Creek displays good species diversity and continuous cover (80%) in the overstorey, middlestorey and understorey. The overstorey comprises approximately 98% native species. *Corymbia calophylla* (Marri) is abundant and there are occasional to infrequent occurrences of *Eucalyptus marginata* (Jarrah) and *E. wandoo* (Wandoo). Infrequent Radiata Pine (*Pinus radiata*) and introduced Wattles (*Acacia* spp.) occur close to the road reserve and within a small garden area of the property adjoining the road reserve. The middlestorey comprises native species almost exclusively, with the only weed species present being a few occurrences of the Giant Reed (*Arundo donax*).

Recommended Strategies

- Encourage the local government authority to construct a box culvert at the crossing point within the road reserve, ensuring that it is the width of the main channel.
- Liaise with landowners to fence off stock access to the banks of the creek.
- Formalise a management plan for the area, to observe any change or decline in foreshore health and ensure the appropriate remedial action is taken.

- Develop a management plan to ensure the protection of the current species diversity.
- Fence off the creek and foreshore fringe from stock access.
- Undertake weed control activities, primarily to prevent the spread of highly invasive weeds such as *Watsonia*, Bridal Creeper and Kikuyu (Appendix 2).
- Hand weed any broadleaf weeds that occur in low numbers prior to flowering and seed set.
- Encourage the landholder to remove, or control any garden exotics in the foreshore zone at the front of the southern-central residence.



Common native species include *Agonis linearifolia* (Swamp Peppermint), *Hakea undulata* (Wavy Leaved Hakea), *Trymalium ledifolium* and *Xanthorrhoea preissii* (Grass Tree). The species list for the middlestorey is quite extensive. Native species are also well represented in the understorey, comprising up to 90% of species present. The most frequent understorey species noted during this survey included *Andersonia lehmanniana*, *Cryptandra arbutiflora* (Waxy Cryptandra), *Dryandra nivea* (Couch Honeypot), *Grevillea bipinnatifida* (Native Fuchsia), *Baeckea camphorosmae* (Camphor Myrtle), *Hibbertia spicata* (Yellow Buttercups), *Hovea chorizemifolia* (Holly-Leaved Hovea), *Leucopogon* sp. (Bearded Heath), *Pimelea* sp., *Petrophile stricta* and *Dampiera alata*. There are also a number of species of rushes and sedges within the creek, which also occur in the dam at the western end of the section. Weeds within the understorey include occasional occurrences of *Watsonia* (*Watsonia bulbifera*), and a few occurrences of Bridal Creeper (*Asparagus asparagoides*), Soursob (*Oxalis pes-caprae*), Shivery Grass (*Briza minor*) and Kikuyu (*Pennisetum clandestinum*). Although present throughout the section, the weeds become more frequent towards the eastern end.

Stream Cover: There is abundant stream cover provided by the fringing native vegetation. Exotic vegetation also provides very occasional stream cover. Within the instream environment there is a good cover maintained by the presence of leaf litter, rocks, branches and vegetation.

Habitat diversity: The diversity of fringing vegetation types along the foreshore provides a range of habitats for terrestrial invertebrates, reptiles, mammals, frogs and birds. The presence of instream riffles, rocks creating cascades, meanders, pools and instream logs also provide diverse habitats for instream organisms. The dam at the western end of the section provides some permanent water. During the time of survey the water was carrying sediment from erosion zones and was slightly turbid (this may have been due to a rainfall event that occurred immediately prior to the survey being conducted).

- Work to increase the extent of fringing vegetation on the southern bank at the east end of the section and fence off from the grazing paddock using appropriate native species listed in Appendix 3.
- Encourage the neighbouring landholders to also manage their gardens so the integrity of the remaining riparian vegetation is not threatened – particularly in relation to the non-native wattles.
- Inform the landholder of the benefits of improving and maintaining foreshore health. Controlling weeds reduces the fire hazard and minimises the potential future expense of controlling highly invasive weeds such as *Watsonia*.

- Encourage landowners to replace ornamental, exotic gardens with native species in particular along areas fringing the foreshore.
- Protect existing foreshore vegetation from stock, through the use of adequate fencing.
- Retain instream features either in situ, or arrange them so that they do not exacerbate erosion of the banks.

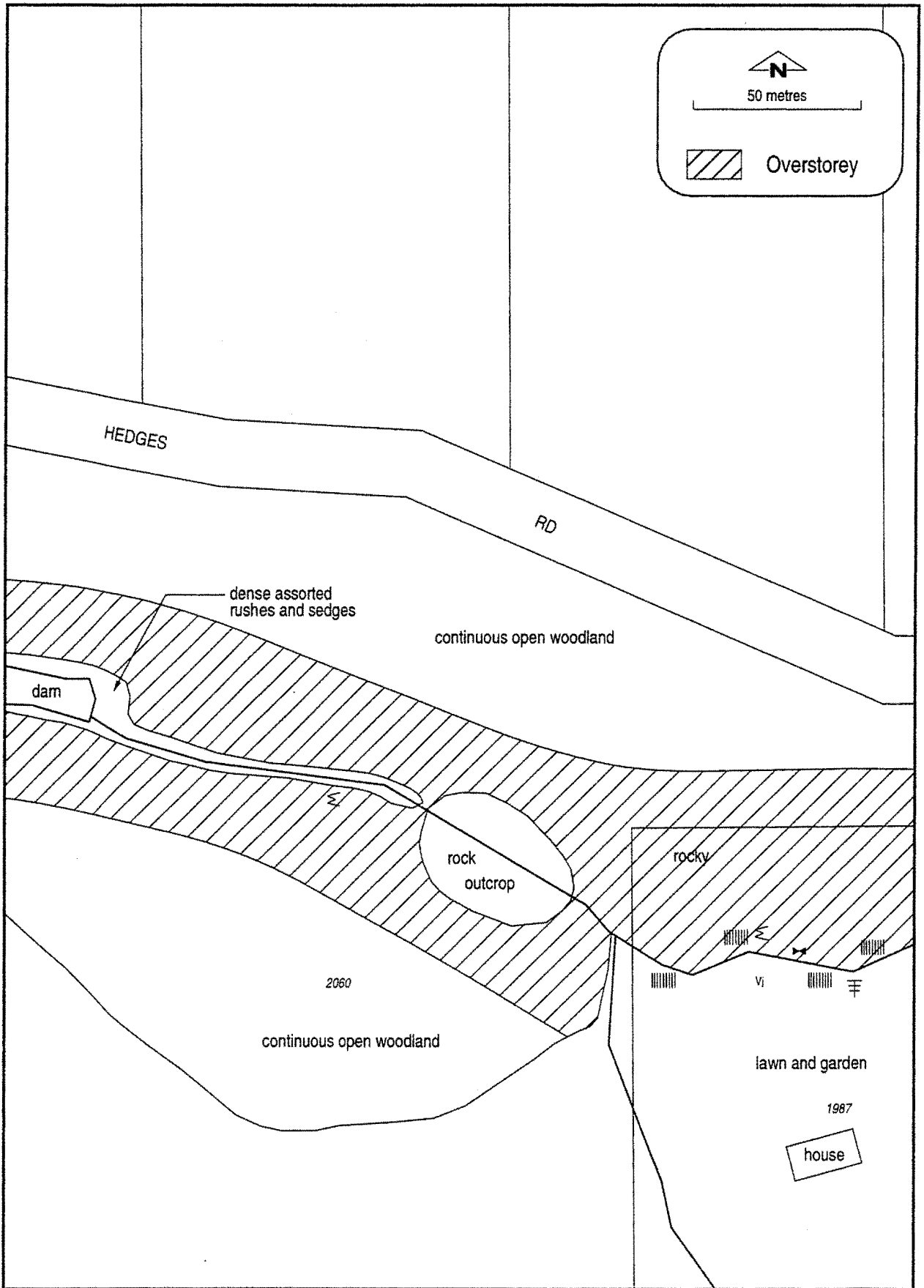
- Protect the foreshore vegetation fringe from degradation pressures, such as grazing.
- Investigate the sources of sediment within the waterways and catchment. Develop strategies to address erosion problems upstream to reduce the current sediment load.
- Develop a fire management plan in conjunction with the Department of Conservation and Land Management, the Shire and the local fire brigade to ensure adequate routes are maintained to protect the area in case of fire.



Other issues: The predominant landuse of the area is changing from largely rural properties to developed residential areas. The presence of foxes within the area is of concern, due to their impact on native fauna.

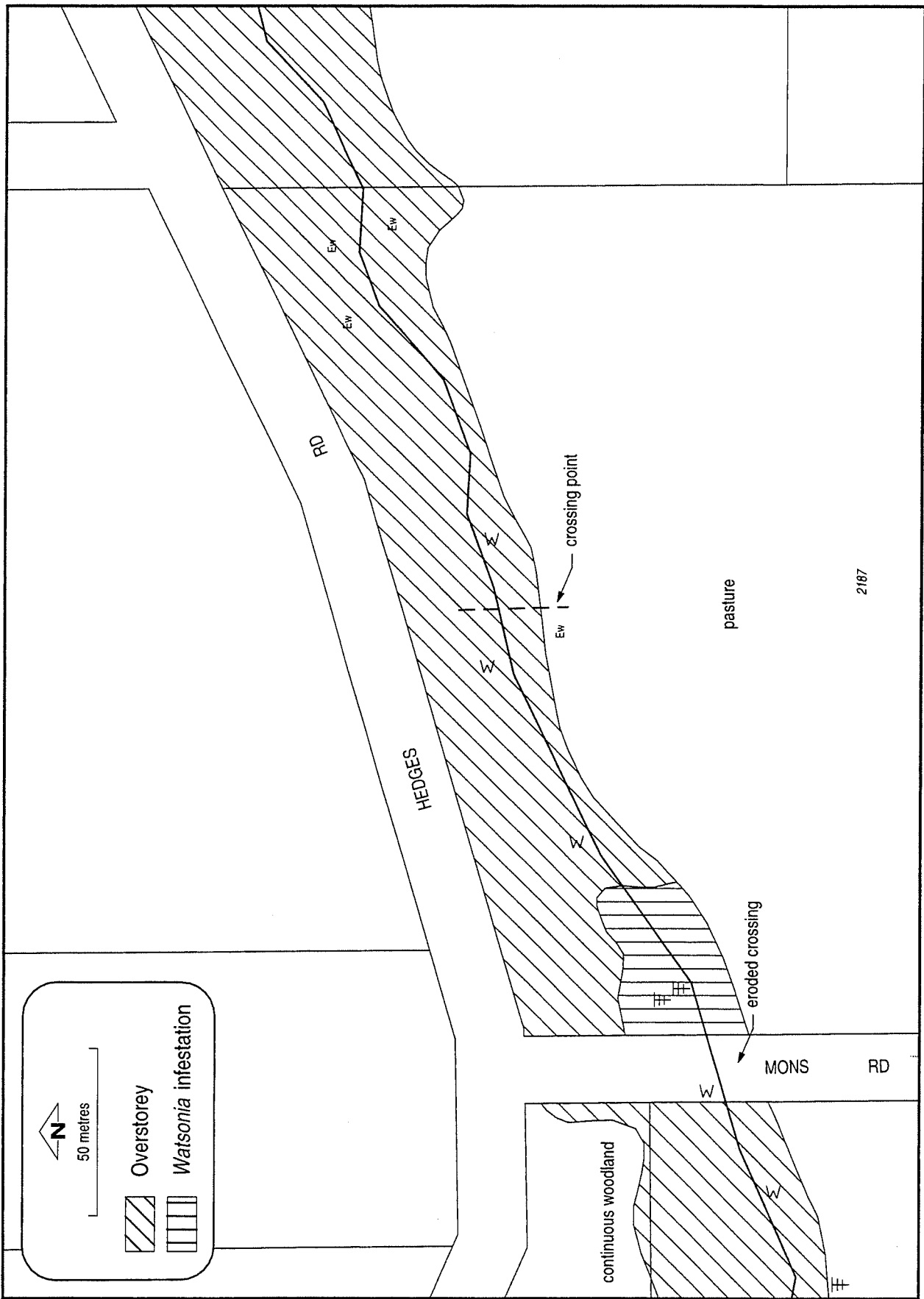
- Liaise with the local government authority to ensure future subdivisions and residential developments in the area have suitable management systems and infrastructure in place, to prevent degradation of the foreshore and stream environments.
- Approach the Department of Conservation and Land Management to undertake feral animal control to eradicate foxes.
- Liaise with the Department of Conservation and Land Management to determine whether or not they would consider including this area and adjoining bushland in the Western Shield program, if the community offers to advise local residents of the program to ensure protection of their pets.





Mahogany Creek Site 5 - Map 1





Mahogany Creek Site 5 - Map 2



4.6 Falls Park

Results Foreshore Condition Survey

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



Jane – Site 6: Map 1 (Section A) Falls Park

Length of section (m): 370 m
Recorder's name: B Wainig
Date surveyed: 12/7/99
Nearest road access: Falls Road
Lot number(s): 91, 92

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 Jane Brook (Site 6, Section A) occurs at the western end of this site. The brook meanders along the front of two private properties. The banks are very steep (>60°) and show signs of instability. The channel is approximately 1 m deep and 2 m wide. The floodplain is wide and shallow on the right side, and a slope (>30°) rising to the left. The creek meanders are typically sharp (closed) bends with significant levels of erosion evident. Slumping and undercutting are also associated with these power-bends. The level of erosion and slumping is considered to be a significant problem. There are also localised areas of sedimentation.

Vegetation: The vegetation structure along this section of the creek exhibits moderate to severe levels of disturbance. Where native vegetation is persisting along the foreshore it is limited to a narrow fringe. The overstorey cover is patchy, and comprises approximately 80% native species. These include frequent occurrences of *Eucalyptus rudis* (Flooded Gum) and *Melaleuca raphiophylla* (Swamp Paperbark). There is also an infrequent occurrence of *Corymbia calophylla* (Marri). There are some weed

Recommended Strategies

- Liaise with the Water and Rivers Commission to investigate the water quantity and quality of the water entering the waterway from the catchment, and develop a strategy to slow water flows for the entire water body.
- Install soft engineering devices, where appropriate, to reduce the amount of erosion and undercutting of the banks (Appendix 4).
- Reinforce the foreshore vegetation with appropriate native species, including rushes and sedges (Appendix 3). Plantings below high water mark may need to be pegged to prevent them from being washed out.
- Ensure that any instream debris is not exacerbating erosion and realign in situ if it is perceived to be a problem.
- Remove weed species, ensuring that any control works do not exacerbate bank collapse or erosion.
- Focus weed control on the highly invasive species *Watsonia*, Cotton Bush, Edible Figs and Bridal Creeper (Appendix 2).
- Liaise with the landholders to encourage them to undertake a gradual replacement of lawn with native species for the first 5 m of the riparian zone.



species in the overstorey including frequent introduced Wattles (*Acacia* spp.) and occasional Edible Figs (*Ficus carica*) and Olives (*Olea europaea*). The middlestorey is sparse throughout, and comprises approximately 50% native species. Species present include occasional or infrequent *Acacia pulchella* (Prickly Moses), *A. saligna* (Coojong), *Agonis linearifolia* (Swamp Peppermint), *Grevillea glabrata* (Smooth Grevillea), *Trymalium ledifolium*, *Viminaria juncea* (Swishbush) and *Xanthorrhoea preissii* (Grass Tree). The weeds present within the middlestorey include frequent occurrences of Tagasaste (*Cytisus proliferus*), and occasional to infrequent Rambling Roses (*Rosa* sp.), Cotton Bush (*Gomphocarpus fruticosus*) and assorted garden plants. The understorey is relatively continuous but only contains around 5% native species. These include a few occurrences of *Macrozamia reidleyi* (Zamia) and *Rulingia cygnorum*. Turf grasses and *Watsonia* (*Watsonia bulbifera*) dominate the understorey. Also present in the understorey are Bridal Creeper (*Asparagus asparagoides*), *Gladiolus* sp., Guildford Grass (*Romulea rosea*) and Kikuyu (*Pennisetum clandestinum*). There is minimal leaf litter present.

Stream Cover: Native vegetation provides frequent stream cover, although there is also some cover offered by exotic vegetation. The patchy nature of the overstorey results in areas of the creek having no, or only minimal, available cover. The presence of deciduous species, such as the Edible Fig, contributes seasonal stream cover. There is some instream leaf litter, branches, vegetation and some rocks providing cover.

Habitat diversity: It is unlikely that there is permanent water within this section of the creek. The water that is present is slightly turbid, reflecting the bank destabilisation and erosion processes. The water depth is variable, with pools to approximately 60 cm. Eddying backwaters create some of these pools and provide habitat for aquatic organisms. The lack of vegetation limits the available habitat diversity for invertebrates, reptiles and other fauna. The trees provide some habitat value, particularly nesting and roosting sites for birds.

- Control Kikuyu in accordance with suggestions in Appendix 2, in a 2 m wide strip around any native vegetation (i.e. work to create a buffer).
- Revegetate the creekline fringe with appropriate species, working to restore middlestorey and understorey (Appendix 3).
- Liaise with landholders to encourage removal of non-native plants including Rambling Rose and other garden plants from the waterway, providing information about the benefits of growing locals.
- Encourage local residents to harvest Tagasaste prior to flowering for fodder for livestock, to reduce the rate of spread of this plant.

- Revegetate the creekline, increasing the extent and density of native vegetation present (Appendix 3).
- Replace deciduous species with appropriate native plants.
- Retain instream features, such as fallen branches, for the provision of cover.
- Re-introduce appropriate native rushes and sedges to the creekline and banks.

- Stabilise the banks using soft engineering techniques in Appendix 4 to reduce erosion and turbidity levels.
- Retain instream features, such as logs, to increase instream habitats.
- Encourage local residents to replace exotic ornamental garden plant species with native plant species, to increase habitat availability for native fauna.



Other issues: The use of the foreshore area to establish exotic garden species is of concern, due to the invasive nature of many of these species. The original creek bed appears to be modified, to increase its recreational value to the property owners, which may be contributing to further bank destabilisation.

- Liaise with the landholders about the impacts of diverting flows and modifying the beds and banks of waterways.
- Consult the Water and Rivers Commission to determine the possibility of assessing the legality of any works that have occurred in the area, and work to restore the natural flows of the waterway.
- Ensure that any works to re-route the creek do not disturb the bank stability.
- Educate the community on the problems associated with growing exotic species within the riparian zone, and how these plants become environmental weeds.
- Promote the use of native species within gardens using Water and Rivers Commission and Department of Conservation and Land Management pamphlets.

Jane – Site 6: Map 2 (Section B) Falls Park

Length of section (m): 350 m
Recorder’s name: B Wainig
Date surveyed: 12/7/99
Nearest road access: Falls Road
Lot number(s): 92, 93

Summary of river health:

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



Description

Bank stability: This section of Jane Brook (Site 6, Section B) exhibits a greater degree of bank stability than Section A. There are only localised areas of erosion, with minimal sedimentation and slumping evident. Up to 50% of the channel bed is a rocky outcrop. Where the waterway forms a channel, the dimensions are approximately 1.5 m wide and 0.75 m deep. The banks of the channel are steep (approximately 60°), which open out to moderately sloped banks fringed with open dry woodland species. There is some evidence of pedestrian access, although this appears not to be having a significant impact on the bank stability of the area.

Vegetation: The vegetation of this section is relatively undisturbed. The overstorey is patchy, characterised by a dry sclerophyll open woodland. The native overstorey species include abundant occurrences of *Corymbia calophylla* (Marri), with frequent occurrences of *Eucalyptus rudis* (Flooded Gum) and *Melaleuca raphiophylla* (Swamp Paperbark). There are scattered introduced Wattles (*Acacia* spp.) also present within the overstorey. The middlestorey is quite dense providing approximately 80% cover, with up to 95% of the species being native including frequent occurrences of *Acacia pulchella* (Prickly Moses), *Agonis linearifolia* (Swamp Peppermint), *Grevillea glabrata* (Smooth Grevillea) and *Hakea undulata* (Wavy Leaved Hakea). Occasional *Trymalium ledifolium*, *Viminaria juncea* (Swishbush), *Xanthorrhoea preissii* (Grass Tree), *Calothamnus quadrifidus* (One Sided Bottlebrush) and *Allocasuarina humilis* (Dwarf Sheoak) also contribute to the middlestorey structure. There is an occasional occurrence of the Giant Reed (*Arundo donax*) which is the only observed weed species within the middlestorey. The understorey provides relatively continuous cover, and comprises up to 80% native species. These include frequent occurrences of *Hibbertia spicata* (Yellow Buttercups) and *Dryandra nivea* (Couch Honeypot), and occasional *Leucopogon* sp. (Bearded Heath), *Cryptandra arbutiflora* (Waxy Cryptandra), *Templetonia biloba*, *Corynotheca micrantha*, *Hovea chorizemifolia* (Holly-Leaved Hovea), *Conostylis* spp., *Borya* spp., and *Lepidosperma* spp. The weed species within the

Recommended Strategies

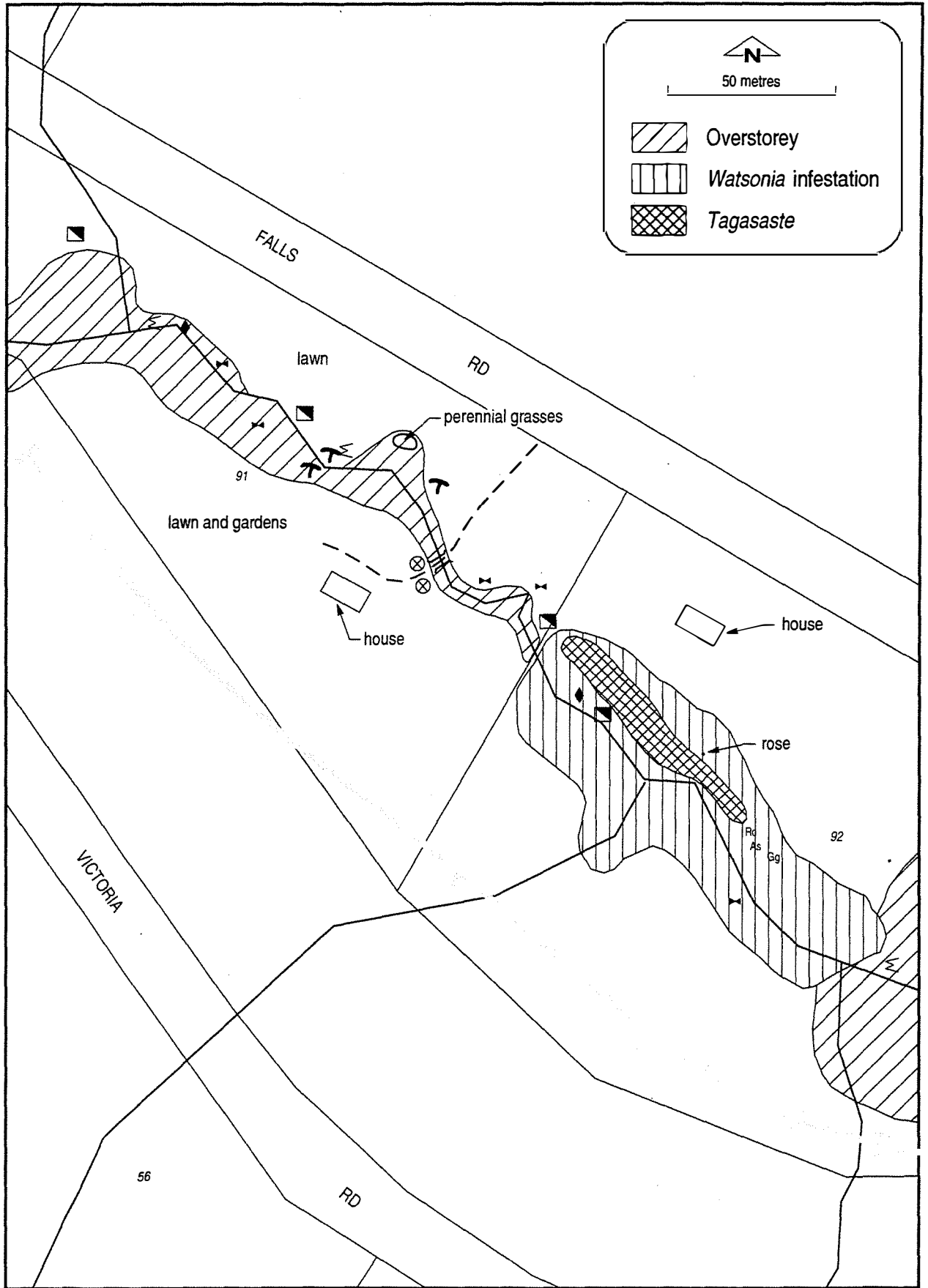
- Ensure sufficient instream vegetation exists at the base of the rocky outcrop, to reduce the effects of scouring and erosion on the main bend within the section.
 - Undertake weed suppression and revegetation with locally indigenous species (Appendix 3).
 - Assess the recreational use of the area and if high, define access using bollards and wood chip guideways to prevent widespread trampling of vegetation, and associated destabilisation of the banks.
-
- Undertake weed control activities, to prevent further spread of the current localised infestations.
 - Focus weed control on the highly invasive Weed Wattles, Giant Reed, Gladiolus and Watsonia using advice outlined in Appendix 2.
 - Remove flower heads prior to seeding of scattered broadleaf weeds to limit increased infestations.
 - Implement a monitoring and assisted regeneration program if there is insufficient natural regeneration and spread of native species after weed control.
 - Define access path(s) using wood chip guideways to reduce the impact of trampling and limit the number of tracks available.
 - Close unnecessary tracks by cutting brush from shrubs and placing over tracks. This will also assist with natural regeneration.
 - Develop a fire management plan for the area in conjunction with the Department of Conservation and Land Management, the Shire, the Fire and Emergency Services Authority of WA and the State Emergency Service to help protect the integrity of this area in the event of fire.



<p>understorey include infrequent to occasional occurrences of <i>Watsonia</i> (<i>Watsonia bulbifera</i>), <i>Gladiolus</i> sp. and Shivery Grass (<i>Briza minor</i>).</p>
<p>Stream cover: Occasional stream cover is provided by the fringing native vegetation. This is consistent with the proportion of cover expected in dry open vegetation communities and the nature of the vegetation along the rocky outcrop section of the creek. Some cover is offered by exotic vegetation such as Weed Wattles and the Giant Reed. Instream cover is provided by leaf litter, branches and rocks.</p>
<p>Habitat diversity: It is unlikely that there is permanent water within this section of the creek. There are some deeper pools, and some areas of very shallow water flowing over the rock outcrops. The highly diverse vegetation surrounding this section of the creek provides a variety of habitats available to the terrestrial invertebrates and reptiles. The frequency of trees and shrubs encourages birds to roost and nest. The rocky outcrop section and pools provide a number of habitats for aquatic organisms.</p>
<p>Other issues: The potential for garden escapes and permeation of fertilisers and grey water entering into the riparian zone is high due to the proximity of residential areas. The impacts of trampling due to recreational use can also be highly disruptive, increasing the possibility of weed encroachment and damage to germinating native seedlings, resulting in a further decline in foreshore vegetation health.</p>

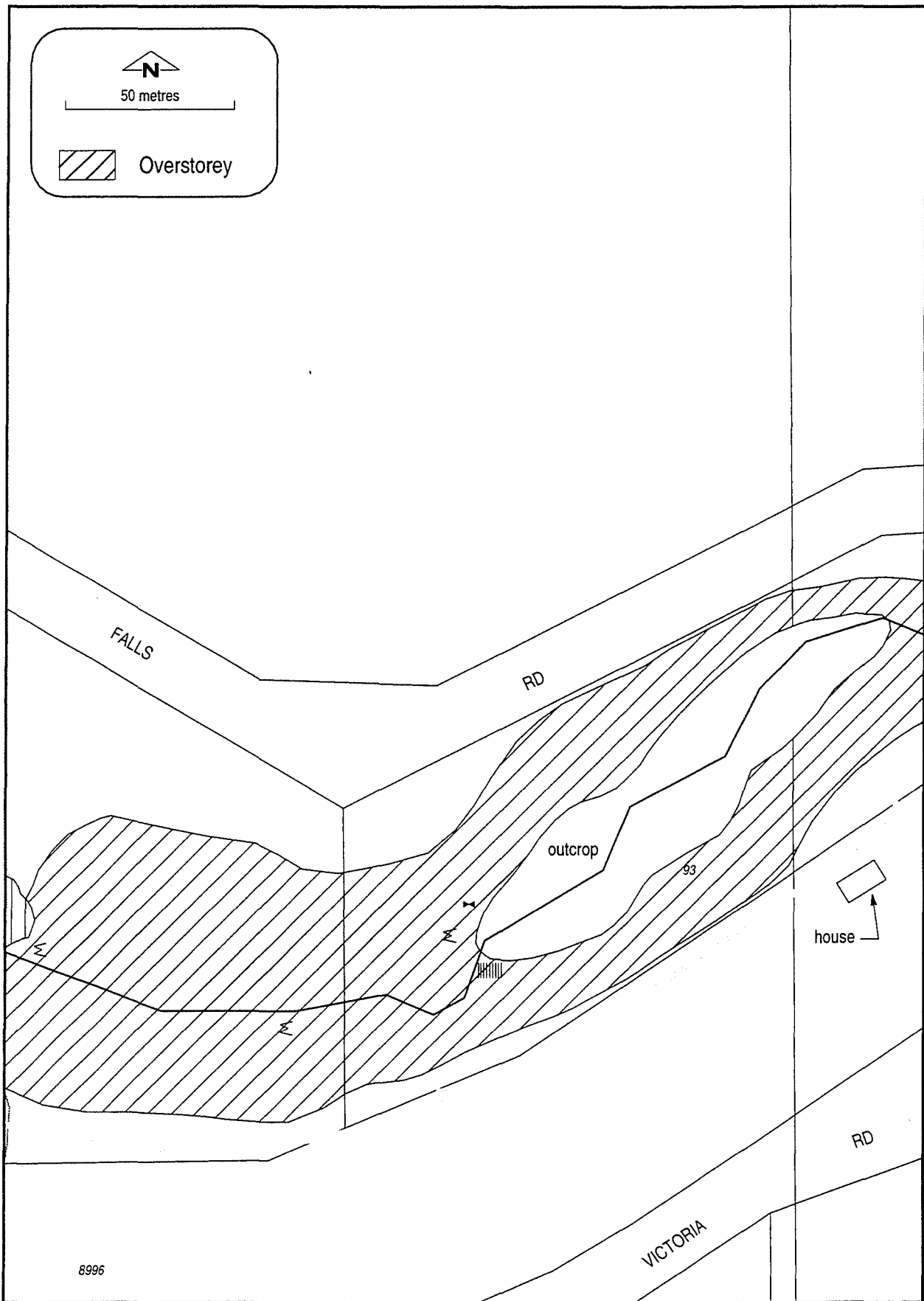
<p>• Remove exotic vegetation, and monitor the level of natural replacement of this vegetation with native fringing or instream vegetation. Should the level of regeneration be minimal, reinforce with tubestock.</p> <p>• Retain instream features, such as branches, for the provision of instream cover.</p>
<p>• Retain instream features for additional habitat value.</p> <p>• Maintain the diverse nature of the native vegetation of the area.</p> <p>• Provide controlled access allowing for fire management and minimising other disturbance factors.</p>
<p>• Educate the local community to the potential impacts of misuse of the creek environment.</p> <p>• Develop a water quality and quantity monitoring program for nutrients and other parameters, to be implemented by local residents with the support of the Shire and the Water and Rivers Commission.</p> <p>• Distribute an information leaflet to local residents encouraging them to become involved in the active management of the creek.</p> <p>• Rationalise access tracks and commence revegetation works such as brush laying and direct seeding.</p>





Falls Park Site 6 - Map 1





Falls Park Site 6 - Map 2



4.7 Brookside Park

Results Foreshore Condition Survey

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



Jane – Site 7: Maps 1-2 Brookside Park

Length of section (m): 690 m
Recorder's name: B Wainig
Date surveyed: 12/6/99
Nearest road access: Johnston Road, Seaborne Street
Lot number(s): 500, 216, 217, 218, 411, 421, 422, 228, 125, 126

Summary of river health:

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity	Stream Condition
Red	Yellow	Yellow	Red	Red
Poor	Moderate	Moderate	Poor	Poor
2	4	4	2	12

Description

Bank stability: This section of Jane Brook (Site 7) flows through residential and parkland areas. The main channel is well defined and exhibits severe levels of erosion with >50% of the section affected. Associated with the erosion, especially on the bends in the creek, are significant levels of slumping. There are also some localised areas of sedimentation, most noticeably on the western side of the bridge on Johnston Road. The banks of the creek are very steep (>60°) and are up to 1.2 m in height and 2 m in width, opening out onto areas of floodplain (now grassed parkland) and upslope into dry open woodland. There are areas where the banks of the creek have been reinforced with cemented rock walling to reduce the levels of scouring and erosion around the bends in the creek.

Vegetation: The vegetation of this area comprises a disturbed open woodland community. The overstorey is patchy, providing a proportionate cover of between 20-80%. The native species present in the overstorey include frequent *Corymbia calophylla* (Marri) and

Recommended Strategies

- Liaise with the Local Authority to assess the existing rock structures and their contribution to bank stability and impact downstream. Modify if appropriate.
- Develop a water quality and quantity monitoring program for nutrients and other parameters, to be implemented by local residents with the support of the Shire and the Water and Rivers Commission.
- Exclude direct access to sections of the bank which are at greatest risk of further destabilisation, by installing temporary fencing and signage.
- Undertake bank stabilisation works as required, utilising soft engineering solutions. Some suggested techniques are provided in Appendix 4.
- Revegetate the banks of the creek, with appropriate native species (Appendix 3), pegging them in place to prevent being washed away during peak flows.
- Undertake weed removal and control, ensuring that works do not exacerbate erosion and slumping of the banks.
- Focus weed controls within existing rehabilitation areas to ensure that any activities occur at a manageable scale.



Melaleuca raphiophylla (Swamp Paperbark), and occasional *Eucalyptus rudis* (Flooded Gum). Non-native species are also present within the overstorey with frequent introduced Wattles (*Acacia* spp.), Giant Reed (*Arundo donax*), Edible Fig Trees (*Ficus carica*) and occasional Radiata Pine (*Pinus radiata*). The middlestorey is poorly represented, and provides sparse cover. The native middlestorey species include occasional to infrequent *Acacia saligna* (Coojong), *Agonis linearifolia* (Swamp Peppermint), *Viminaria juncea* (Swishbush) and *Xanthorrhoea preissii* (Grass Tree). The dominant weed species in the middlestorey include Castor Oil (*Ricinus communis*), Tagasaste (*Cytisus proliferus*) and the introduced Bulrush (*Typha orientalis*). The understorey is continuous, but contains poor diversity of native species. Native species present include infrequent to occasional *Acacia alata* (Winged Wattle), *Macrozamia reidleyi* (Zamia) and at least two native sedges. The dominant weeds of the understorey include Watsonia (*Watsonia bulbifera*), *Phalaris* spp., *Paspalum* spp, Bridal Creeper (*Asparagus asparagoides*) and Kikuyu (*Pennisetum clandestinum*). Towards the eastern end of the section there is a rehabilitation site containing a range of planted native species.

Stream Cover: The native vegetation provides frequent areas of permanent stream cover. Exotic vegetation also provides some degree of cover, however this is seasonal as the species present are deciduous. Instream cover is available in the form of leaf litter, rocks and branches. The stand of the introduced bulrush also provides instream cover.

Habitat diversity: Due to the disturbed nature of the site, there is limited habitat diversity. It is possible that there is some permanent water within this section. The water at the time of survey was milky brown in colour. There are some protected basking sites, where there is leaf litter and logs. These would be suitable for invertebrates and reptiles. The trees also provide habitat for nesting and roosting birds.

- Clearly define access trails and points within the foreshore rehabilitation areas, to reduce the impacts of indiscriminate trampling.
- Provide education materials to residents with information relating to the benefits of revegetating the stream and riparian zone with native plants and what they can do in their gardens and houses to help the foreshore.
- Install signage which identifies features of interest, encourages people to keep to the walk trails and provides contact details if they wish to become involved in foreshore management activities.
- Focus weed control works on Castor Oil, Tagasaste, introduced Wattles, Giant Reed, Watsonia, Bridal Creeper and Edible Fig, using suggested techniques (Appendix 2).
- Brushcut the introduced Bulrush and grasses (*Paspalum*, *Phalaris* and *Kikuyu*) regularly, particularly prior to seeding of the first two species, to reduce their spread and reduce fire hazard.
- Establish a boundary between parkland and revegetation areas with bollards, pathways or an equivalent structure, and use this barrier as the weed management barrier.
- Revegetate foreshore zones, with appropriate locally derived native species (Appendix 3) moving outward from current rehabilitation works or in small manageable nodes where weeds have been controlled.

- Retain instream features for the further provision of cover.
- Replace the exotic Bulrush with the native Bulrush (*Typha domingensis*) to maintain cover for fauna.
- Remove deciduous trees (Appendix 2), and replace with native tree species (Appendix 3).

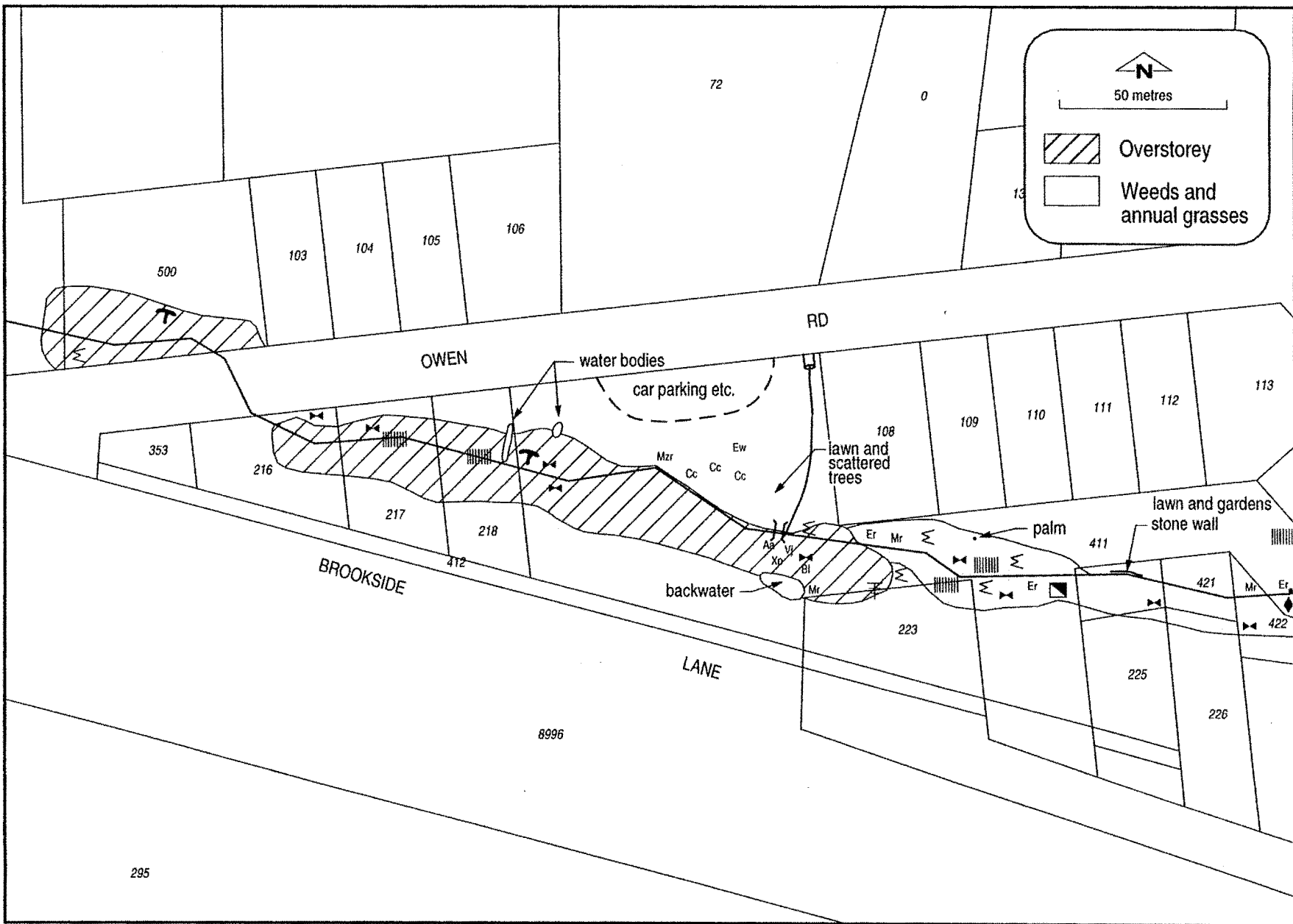
- Retain instream habitat features.
- Revegetate the area with a range of appropriate native plant species.



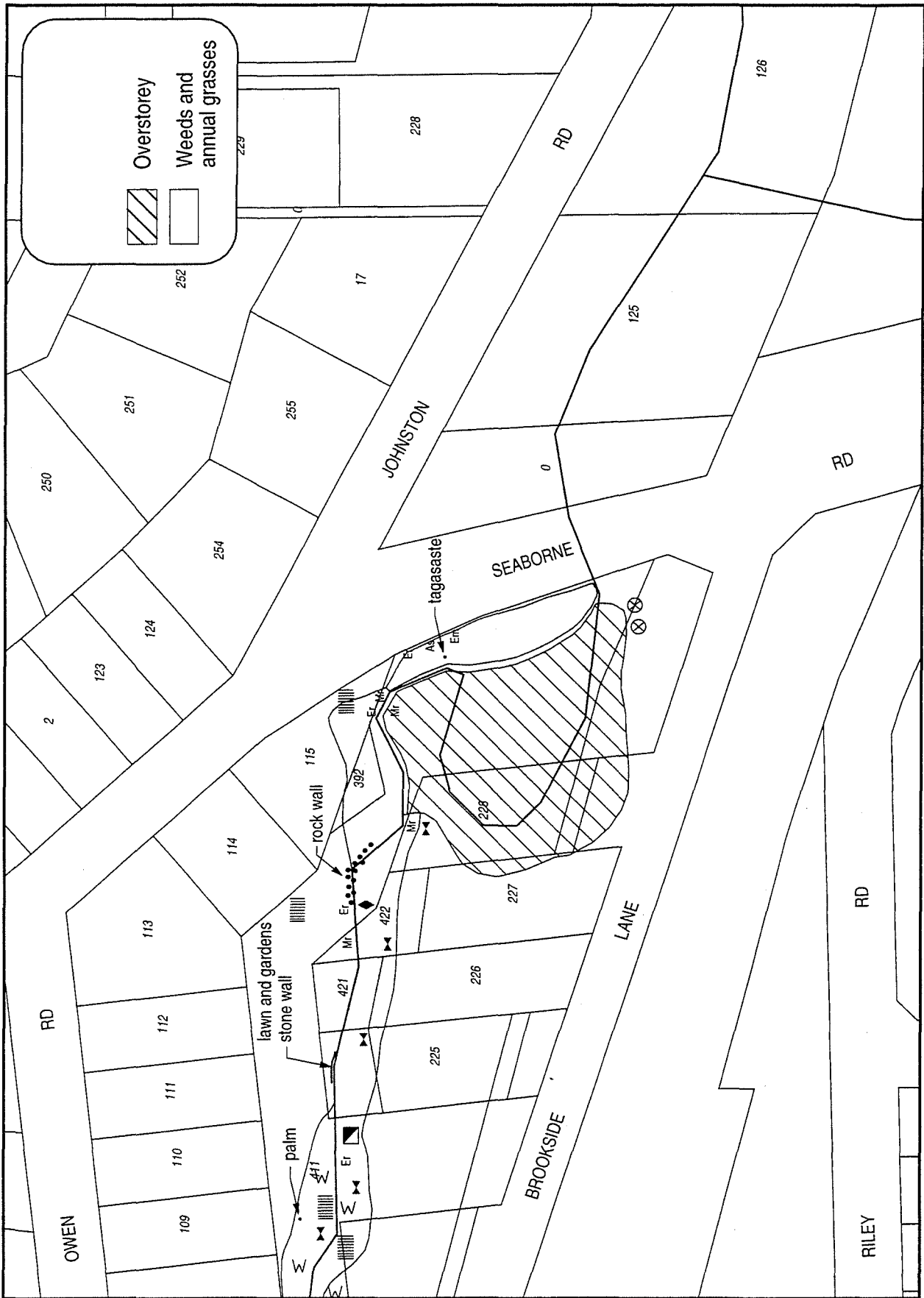
Other issues: This site is predominantly used as a picnic and recreation spot, and consequently the remnant bushland has additional pressures associated with such use. Threats to the riparian zone include trampling of seedlings resulting from natural regeneration and supporting rehabilitation works, higher levels of rubbish present and a greater fire threat. The banks of the stream are, in some places, very steep and relatively unstable and represent a safety issue for young children and other users of the park. Regular mowing of some of the area may be helping control the spread of *Watsonia*. The mowing, however, extends beyond the lawn area into the bushland, which may be limiting natural regeneration of the local species present. There is evidence of a recent fire, near the Johnston Road bridge. There is community group involvement in this area with works including revegetation efforts and weed suppression.

- Provide additional rubbish bins and ensure that they are well maintained and managed.
- Install clearly defined paths for passive recreation through the riparian zone, using materials that can not be damaged during peak flow events.
- Install temporary fencing of any serious erosion zones which are unstable and inherently dangerous and to protect rehabilitation sites.
- Develop a fire management plan for the area in conjunction with the Department of Conservation and Land Management, the Shire and the local fire brigade to ensure response plans are in place.
- Install some form of definition between the recreational use park areas and the bushland, using bollards or equivalent.





Brookside Park Site 7 - Map 1



Brookside Park Site 7 - Map 2



4.8 Clutterbuck Creek

Kilburn Road

Results

Foreshore Condition Survey

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



Jane – Site 8: Maps 1-2 (Section A) Clutterbuck Creek

Length of section (m): 830 m
Recorder's name: B Waining
Date surveyed: 30/6/99
Nearest road access: Kilburn Road
Lot number(s): 1636 - Parkerville Children's Home; Annette Roberts/ Stan Gough. Ph. (08) 9295 4400

Summary of river health:

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity	Stream Condition
Yellow	Yellow	Red	Yellow	Yellow
Moderate	Moderate	Poor	Moderate	Moderate
4	4	2	4	14

Description

Bank stability: The channel of Clutterbuck Creek along this section (Site 8, Section A) is approximately 2 m wide and 0.5 m deep. The banks are steep, with a gradient ranging from 45° to 60°. These foreshore banks exhibit significant levels of erosion, especially at the bends. Localised areas of sedimentation and slumping are also present within the main channel. There are some artificial bank stabilisation structures, such as concrete aprons and rocks around culverts, and a concrete reinforced instream crossing point for horses. There have been significant modifications to the main channel, to create an instream island refuge for native fauna. The banks of the island have, at this stage, not been reinforced in any way, and so are susceptible to erosion. A dam has also been constructed which is approximately 100 m x 40 m and has low walls. These walls do not appear to impede on creek flow. Rocks have been set at the outflow to aid in the prevention of erosion, and a silt trap at the inflow end of the dam helps in preventing sedimentation occurring due to upstream erosion.

Vegetation: Most of the vegetation present along this survey section is the result of considerable revegetation and mulching efforts undertaken by the landholders. Mulch has been used to control weeds and encourage growth. However, many of the species that have been planted, are interstate species or

Recommended Strategies

- Continue revegetation works to increase the extent of the riparian vegetation using appropriate native species (Appendix 3).
- Plant more instream vegetation, such as rushes and sedges, and peg the tubestock into place to prevent the plants from being washed out during peak flows.
- Liaise with the Water and Rivers Commission to investigate stream flow characteristics and relate to changes with increasing levels of development in the area. Work to reduce the velocities of water moving through Clutterbuck Creek.
- Stabilise the banks of the earthworks area, using soft engineering techniques (Appendix 4) and/or revegetation using appropriate species (Appendix 3).
- Continue revegetation efforts, focusing species selection on locally indigenous plants (Appendix 3).
- Increase the density of vegetation along the western end of the site.



originated from other areas of WA, including a range of Eucalypt and *Melaleuca* species. Overall the overstorey of this site is patchy, with approximately 20-80% cover present. Native species of the overstorey include frequent occurrences of *Corymbia calophylla* (Marri). Other locally native species used in the revegetation program include *Eucalyptus laeliae* (Darling Range Ghost Gum), *E. rudis* (Flooded Gum), *E. marginata* (Jarrah) *Melaleuca raphiophylla* (Swamp Paperbark), and *Melaleuca* sp. Weed trees present within the overstorey include introduced Wattles (*Acacia* spp.), Edible Figs (*Ficus carica*) and a few Willows (*Salix* sp.). The middlestorey is also patchy, and includes natural occurrences of *Acacia pulchella* (Prickly Moses), *A. saligna* (Coojong), *Agonis linearifolia* (Swamp Peppermint), *Astartea fascicularis* (Common Astartea), *Hakea amplexicaulis* (Prickly Hakea), *H. lissocarpha* (Honeybush), *Trymalium ledifolium*, *Viminaria juncea* (Swishbush) and *Xanthorrhoea preissii* (Grass Tree). All these species have been utilised in the revegetation zones. The understorey is continuous but retains only approximately 5% native species including *Juncus pallidus* and *Lepidosperma* spp. The dominant weeds include a mixture of annual pasture species, *Watsonia* (*Watsonia bulbifera*), Bridal Creeper (*Asparagus asparagoides*), Guildford Grass (*Romulea rosea*) and Kikuyu (*Pennisetum clandestinum*). The landholder is endeavoring to control these weeds. Behind the dam there is an area of thick, healthy rehabilitation consisting of species of Eucalypts, Paperbarks and *Agonis linearifolia* (Swamp Peppermint).

Stream Cover: There is frequent stream cover afforded by both the native and exotic fringing vegetation. Deciduous trees only offer seasonal shading protection. Instream cover is present in the form of leaf litter, rocks and branches.

- Stabilise any areas of bare ground using a combination of direct seeding and planting.
 - Focus weed control on Bridal Creeper, introduced Wattles, Edible Figs and *Watsonia* using techniques suggested in Appendix 2.
 - Remove Willows, ensuring that correct procedures are followed so as not to spread them further downstream. Monitor for new suckers and control. Ensure that any works do not impact on bank stability.
 - Re-introduce more native rushes and sedges to the instream environment ensuring that they are protected from fauna or from being washed away during establishment (Appendix 3).
 - Ensure sufficient maintenance weed control is undertaken in native and successfully revegetated areas.
 - Control Kikuyu using methods outlined in Appendix 2.
 - Maintain a detailed log about the revegetation works including weed control, species removed, species planted, relative success of different techniques employed and the time of year that works have been undertaken. This could be done by the Parkerville Children's Home and could be linked with an Herbarium for the site, to improve their knowledge and understanding of the environment and to ensure increased success of future works.
- Increase the amount of instream vegetation to increase cover, using species suggested in Appendix 3.
 - Continue revegetation of the riparian zone.
 - Retain instream cover features.
 - Liaise with the landholders to encourage them to remove the deciduous trees, and replace them with appropriate locally indigenous species (Appendix 3).



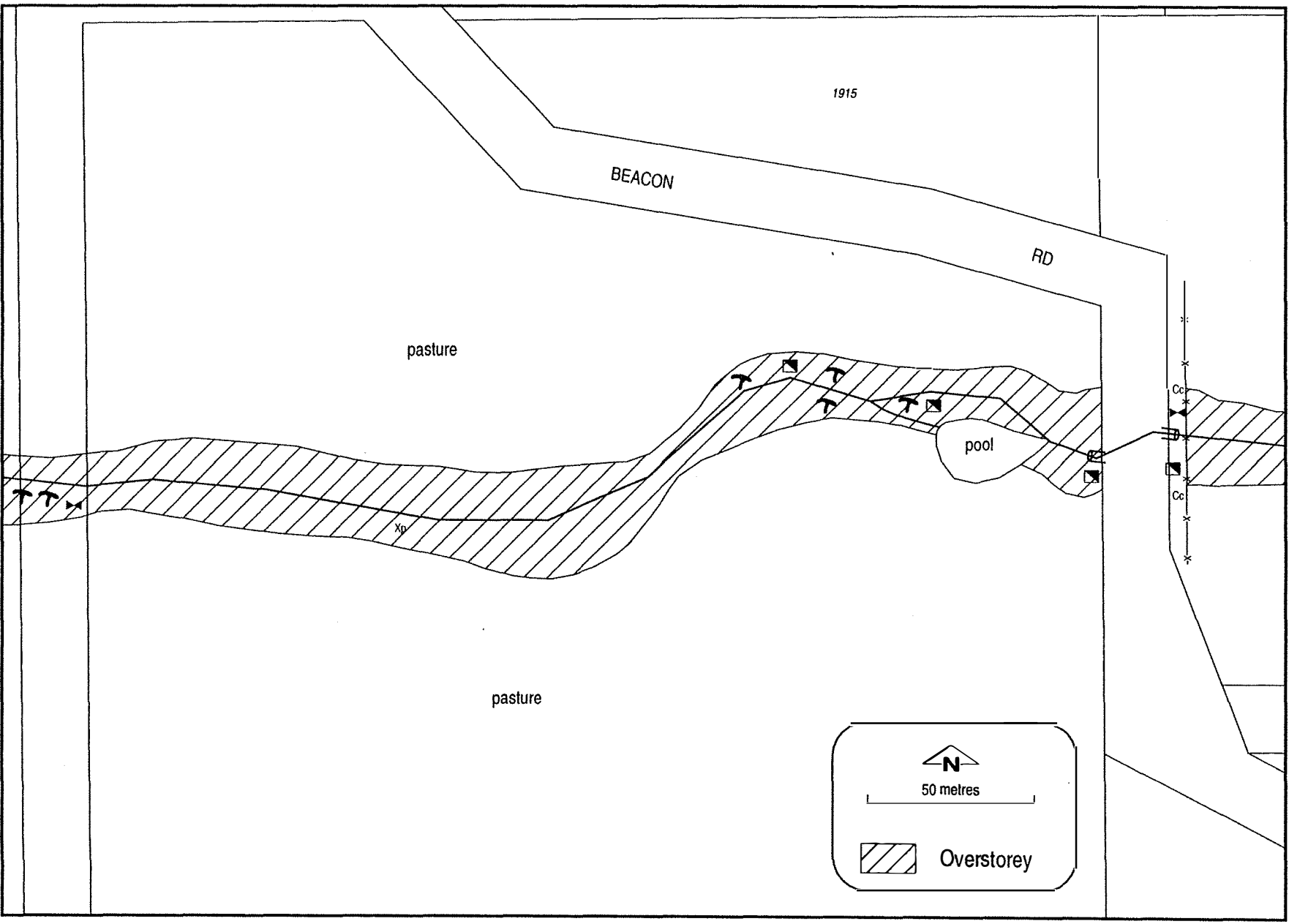
Habitat diversity: The construction of a dam has resulted in the creation of areas of permanent water. This is an artifact of the management system. The channel retains a flow of <20 cm of water. The water quality appears to be good with very little turbidity apparent. Wildlife present includes frogs, black cockatoos, geese, swamp hens, marron and kangaroos. There is diverse habitat available for fauna and flora, with the range of vegetation types offering habitat and protected basking sites for invertebrates and reptiles. Some areas around the dam also have dense streamside vegetation that would be suitable frog habitat. The trees provide nesting and roosting sites for birds. The combined instream values of the creek and dam include riffles, meanders and pools, and instream logs for the aquatic organisms. An island has been constructed, with a deep moat surrounding it, to give refuge to the native waterbirds of the area, protecting them from foxes and feral cats.

Other issues: This area provides valuable environmental education and practical experience to the children at the Parkerville Home. The island provides good waterbird protection, but care is required to ensure excessive sediment does not enter the waterway from the banks of these earthworks. The paddocks surrounding the creek are used for horse grazing and equestrian events.

- Retain instream habitat features.
- Maintain vegetation diversity which is consistent with the composition of native riparian areas, when designing revegetation works.
- Liaise with the Water and Rivers Commission to assess the integrity of the stream and the requirements for environmental flows and ensure that the flow is managed for the benefit of native vegetation and fauna in situ and downstream.
- Ensure the volume of water drawn from the dam does not reduce the overall water levels to a level that compromises the habitat values of the dam.
- Liaise with landholders to encourage them to exclude geese and horses from the waterway and dam as they contribute nutrients and faecal coliforms and may disturb the substrate.

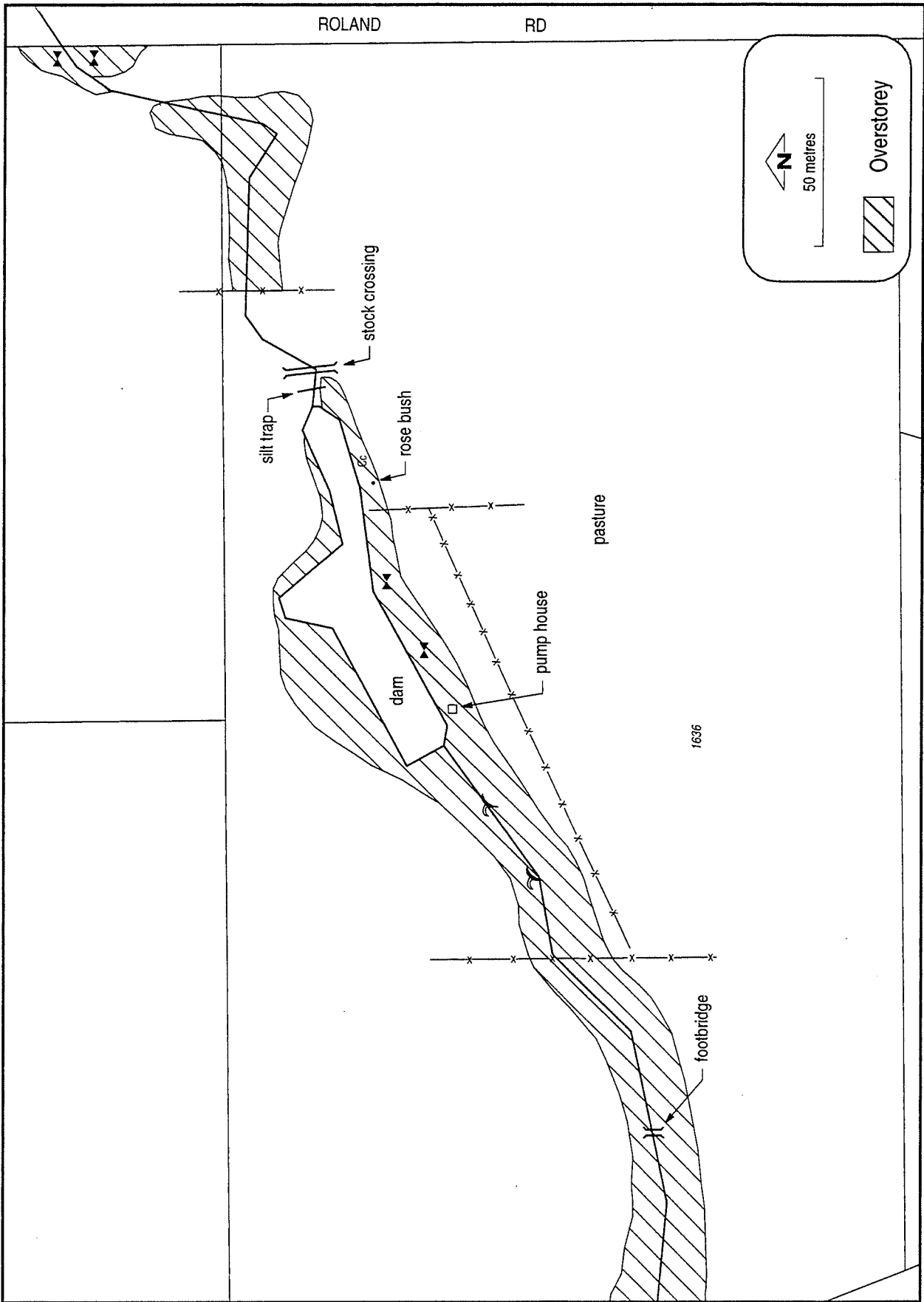
- Liaise with the Water and Rivers Commission to develop a management strategy for the creek and obtain ideas for stabilising the island and creek beds.
- Construct sand mini-interceptor banks parallel with the creek to catch the faecal material and runoff, to retain as much of the material onsite.
- Provide the Parkerville Home with pamphlets from all relevant government agencies to support their work and increase the educational information available to the children about maintaining the health of riparian areas.





Clutterbuck Creek - Kilburn Road Site 8 - Map 1





Clutterbuck Creek - Kilburn Road Site 8 - Map 2



4.9 Clutterbuck Creek

Roland Road

Results

Foreshore Condition Survey

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



Jane – Site 9: Maps 1-2 (Section B) Clutterbuck Creek

Length of section (m): 850 m
 Recorder's name: B Wainig
 Date surveyed: 30/6/99
 Nearest road access: Roland Road
 Lot number(s): 74, 75, 76 - Parkerville Homes

Summary of river health:

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity	Stream Condition
Green	Green	Blue	Yellow	Green
Good	Good	Excellent	Moderate	Good
6	6	8	4	24

Description

Bank stability: The waterway along this section of Clutterbuck Creek (Site 9) is relatively undisturbed and has very stable banks with a moderate slope of 10-45°. The channel is up to 1.5 m wide and is <0.5 m deep. There is only minimal erosion and slumping with some localised sedimentation. There is a dam within the channel of the creek, which has been excavated from the channel. Culverts have been installed wherever the creek passes under a crossing, effectively protecting the bank from erosion. Sheep have direct access to the creek in the southern area of the section.

Vegetation: The vegetation of this creek section is very thick in cover, although the species diversity is relatively low. The overstorey is patchy, providing 20-80% cover. The overstorey species include occasional *Corymbia calophylla* (Marri) and infrequent occurrences of *Melaleuca raphiophylla* (Swamp Paperbark), *Eucalyptus marginata* (Jarrah) and *E. laeliae* (Darling Range Ghost Gum). There are also a few occurrences of introduced Wattles (*Acacia* spp.) and Edible Figs (*Ficus carica*). The middlestorey of this site consists almost exclusively of *Agonis linearifolia* (Swamp Peppermint). The dominance of this species provides a closed middle

Recommended Strategies

- Encourage the landholder to revegetate the margins of the dam completely with native rushes and sedges (Appendix 3).
 - Investigate the sources of sediment, and where possible, develop strategies to reduce the water and sediment load entering the tributary.
 - Encourage landholders to re-align fences to exclude sheep from the creek in the southern sections of the site.
 - Install off-line watering points for livestock.
-
- Liaise with the landholder to encourage management of the waterway for conservation, and possible use as a demonstration site for other landholders interested in re-establishing a native vegetation community.
 - Establish a 5 m wide buffer zone (which may be able to function as a fire access track) beyond the native riparian vegetation to protect it from further weed encroachment and fence off.
 - Control highly invasive species such as Weed Wattles, Edible Figs, Watsonia and Bridal Creeper as a priority to help maintain the integrity of the vegetation (Appendix 2).



canopy over the creek for up to 80% of the section. The understorey includes infrequent occurrences of shrubs such as *Hakea lissocarpa* (Honeybush), and *Hypocalymma angustifolium* (White Myrtle). The dominant understorey vegetation is represented by species of *Juncus*, *Lepidosperma* and *Isolepis*. These rushes and sedges are frequent in their occurrence within the creek line, and dominate the vegetation in isolated places. Weeds within the understorey include occasional to infrequent occurrences of *Watsonia* (*Watsonia bulbifera*), Bridal Creeper (*Asparagus asparagoides*), Fleabane (*Conyza* spp.) and Kikuyu (*Pennisetum clandestinum*). Guildford Grass (*Romulea rosea*) occurs frequently on the edges of the fringing vegetation, especially in the pastured areas at the northern end of the section.

Stream Cover: The middlestorey and understorey vegetation provides abundant stream cover along the foreshore. The dam is the only area of the creek that is not covered completely by overhanging vegetation. Instream vegetation, leaf litter and branches provide cover for the aquatic organisms.

Habitat diversity: The only permanent water within this section of the creek is in the dam. Along the main channel, the water is shallow and slow moving. The water is well filtered by the instream vegetation, and therefore does not show any signs of turbidity. Wildlife observed during the survey included kangaroos, frogs and bandicoots. Paddocks surrounding the area are stocked with sheep. The dense vegetation provides ample protection for fauna movement, reptile and invertebrate basking sites, and nesting and roosting sites for birds. The dense nature of the instream rushes and sedges gives good habitat for frogs.

- Revegetate the dam banks by placing brush from the Swamp Peppermint onto the banks, to provide a seed source and suppress weed growth.
- Monitor the effectiveness of weed control activities, particularly for *Watsonia* and Bridal Creeper, and maintain vigilance with control efforts.
- Hand weed Fleabane prior to flowering to reduce further spread of this species.
- Control Guildford Grass and Kikuyu (see Appendix 2) within the buffer zone and in any localised patches within the healthy vegetation zones, ensuring absolute care is taken not to disturb or damage the native vegetation.
- Ensure that infrastructures associated with residential developments do not result in degradation of the waterway.

- Maintain the health of the remnant vegetation through implementing stock management and weed control as outlined above.
- Revegetate the dam banks with appropriate fringing vegetation, using seed and brush collected on site taking care not to disturb healthy vegetation.

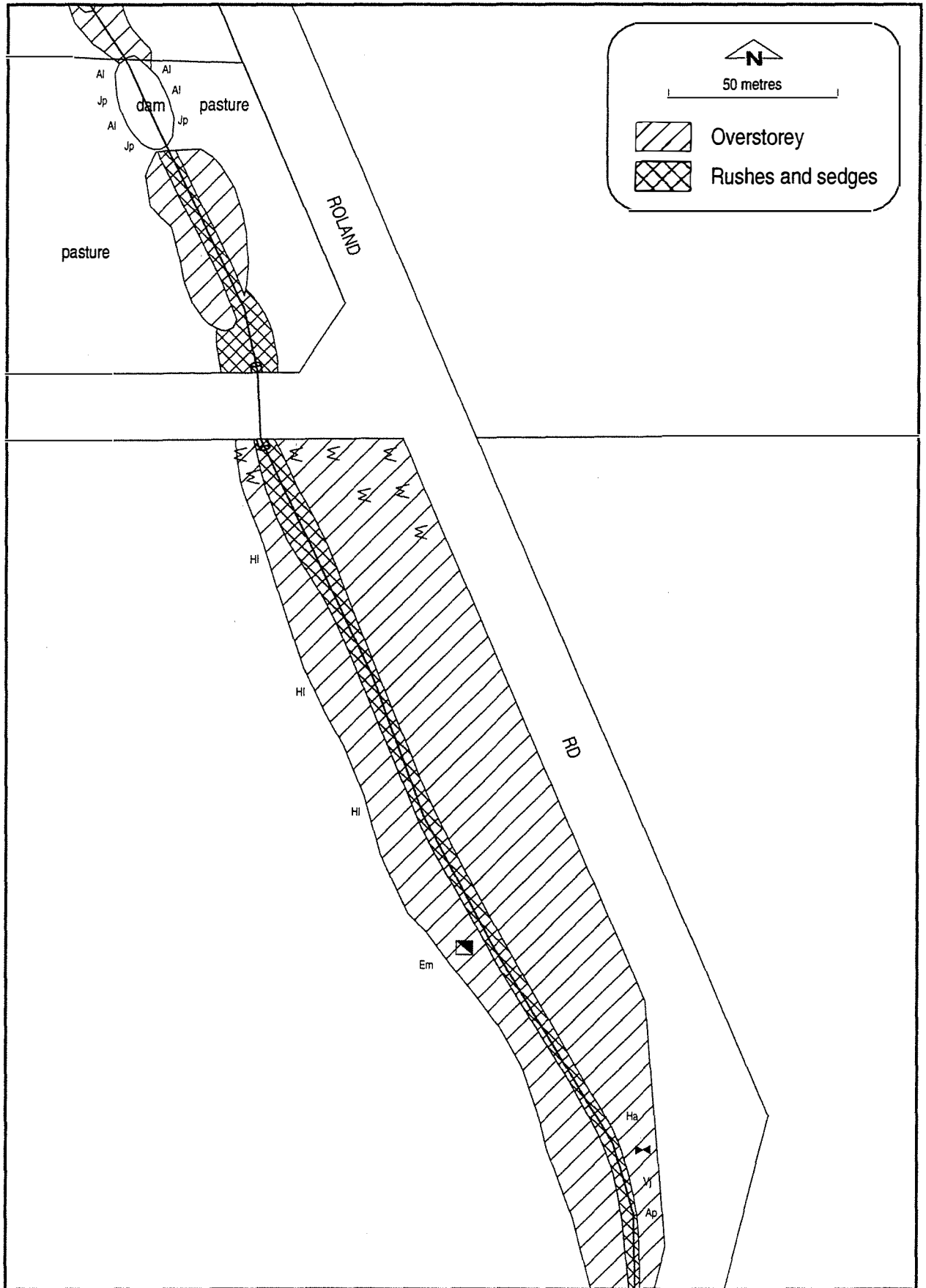
- Retain instream habitat features, such as logs and branches.
- Liaise with the local government authority to ensure encroaching residential development has land management plans to avoid degradation of the waterway environment.



Other issues: The new subdivision adjacent to the waterway is a potential threat to ongoing stream health. There are some minor levels of rubbish within the stream section. The lack of fencing of remnant vegetation allows the livestock (sheep) indiscriminate access to the creek. Continued grazing pressure may reduce the values of this riparian zone. The road converges with this section of the waterway, and crosses the creek at the southern end of the section. Road runoff may be a source for pollutants, weed seed and fragments and rubbish.

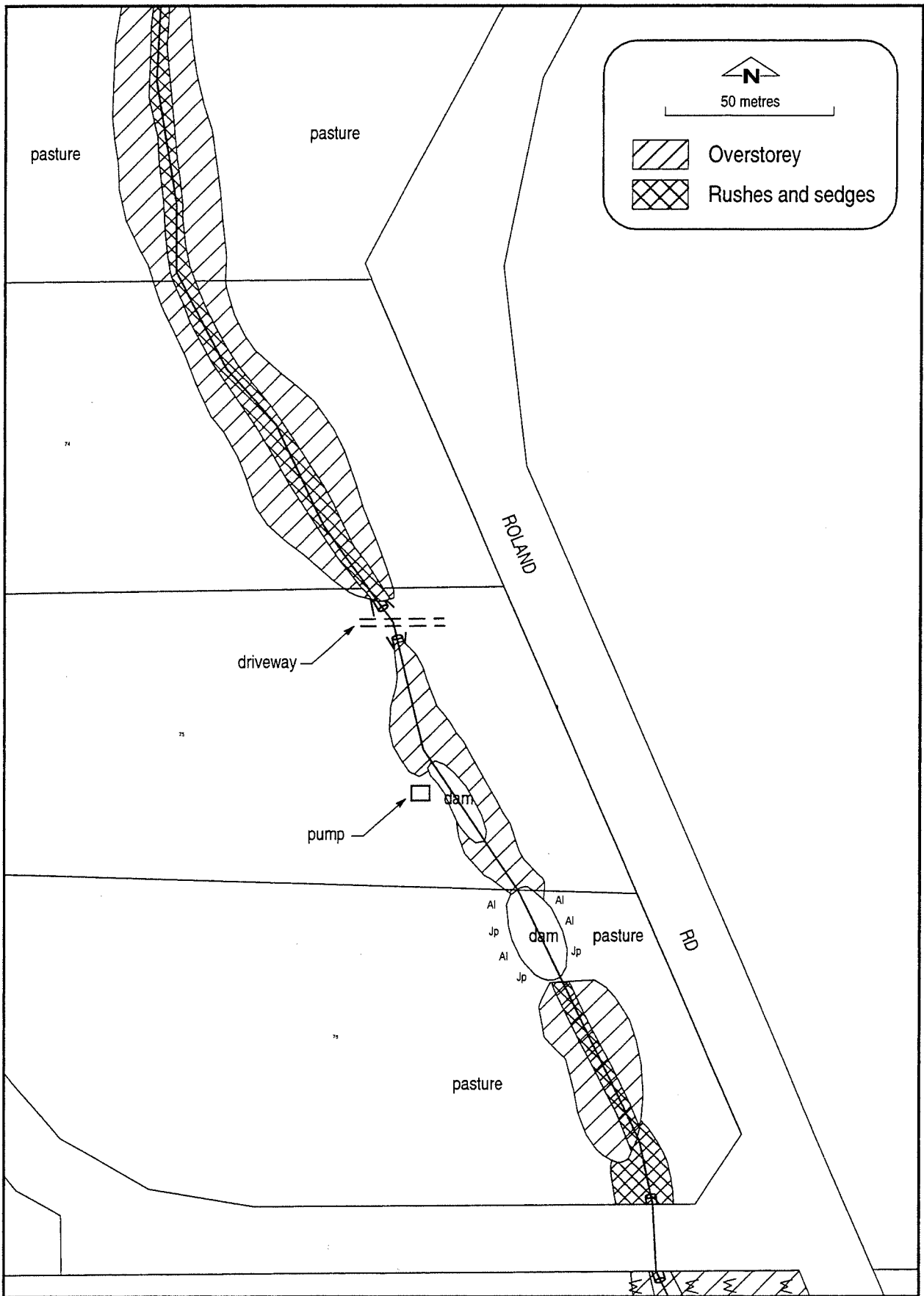
- Determine if the local government authority has ensured that any future proposals for subdivisions provide for best management practices and sustainable management of the waterway.
- Fence off all areas of remnant vegetation to prevent sheep access. Establish fences at least 5 m away from the vegetation to establish a buffer zone to facilitate weed management and fire access. Focus management effort within this buffer zone and in any localised infestations to minimise spread.
- Liaise with Main Roads WA, the local government authority and the Water and Rivers Commission to ensure roadside stormwater drainage networks are constructed in accordance with water sensitive urban design principles to maximise water and sediment retention upslope. This will minimise disturbance associated with excess sediment and greater water influx to the creek and possibly trapping rubbish by installing a gross pollutant trap.
- Provide new landowners with an information brochure outlining techniques for managing waterways and the benefits of retaining significant levels of native vegetation.





Clutterbuck Creek - Roland Road Site 9 - Map 1





Clutterbuck Creek - Roland Road Site 9 - Map 2



4.10 Clutterbuck Creek

Beacon Road

Results

Foreshore Condition Survey

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



Jane – Site 10: Map 1 Clutterbuck Creek

Length of section (m): 420 m
 Recorder's name: B Wainig
 Date surveyed: 30/6/99
 Nearest road access: Beacon Road
 Lot number(s): 12800, 90

Summary of river health:

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

Description

Bank stability: This section of Clutterbuck Creek (Site 10) exhibits severe levels of erosion and slumping along the entire length of the survey site. There is minimal sedimentation. The incised channel of this tributary is approximately 1 m in width and up to 1 m in depth. The banks of the creek are very steep, up to 90°. There is a dam situated at the northern end of the section, before the creek runs under the road, and flows down through a paddock to a dam at the southern end of the section. A tributary enters the creek from the east, approximately midway along the section. This stream tributary has been diverted from its original course, by excavating a straight channel. The channel has been constructed along an existing fenceline, and wooden baffles have been installed to slow water flow. This tributary ends in a dam approximately 20 m from the main channel. There is no overflow facility from this dam to the main channel.

Vegetation: The vegetation along this section is rated as very poor due to the lack of native species present in the foreshore area. The majority of the length of the creek section is characterised by a pastured paddock, with no fringing vegetation other than annual pasture grasses. There are some small patches of native vegetation present along the road verge, where the creek flows under the road. There are two occurrences of *Kennedia prostrata* (Running

Recommended Strategies

- Install riffles to slow water flow in the main channel. This should encourage sedimentation and lessen scouring and erosion of banks.
 - Install soft engineering techniques to stabilise the banks of the existing channel (Appendix 4).
 - Revegetate along the edge of the channel with appropriate native species (Appendix 3).
 - Monitor the channel to ensure that its construction can cope with flows. Investigate the possibilities of recreating a living stream along this channel.
-
- Liaise with landholders to encourage them to consider revegetating the waterway and advise them of the benefits, such as increasing foreshore stability, improving the habitat for native fauna and that property values can be higher for areas that have retained their natural values.



Postman) along the banks of the channel. The creek functions more as a drain than a living stream. There has been an effort very recently to replace some vegetation with the planting of a few Eucalypt seedlings between 15-20 m from the channel edge. There are two seeps where *Lepidosperma* spp. have become established, one at the northern end, the other at the southern end.

Stream cover: There is no stream cover along this section of Clutterbuck Creek due to the lack of fringing vegetation along the channel. There is also no instream cover for aquatic organisms.

Habitat diversity: The dams are the only sites of permanent water. There are some frogs existing within the seepage areas, amongst the *Lepidosperma* spp. rushes. There is no other foreshore vegetation or structures offering habitat value within the foreshore zone of the creek.

Other issues: The uncontrolled stock access and deficiency of defined crossing points, combined with an absence of native vegetation cover, results in a combined stream health rating of Very Poor (Black). The stream lacks environmental functions and values, apart from drainage. Hydrological disturbances, such as the dams, have further decreased the integrity of the creek.

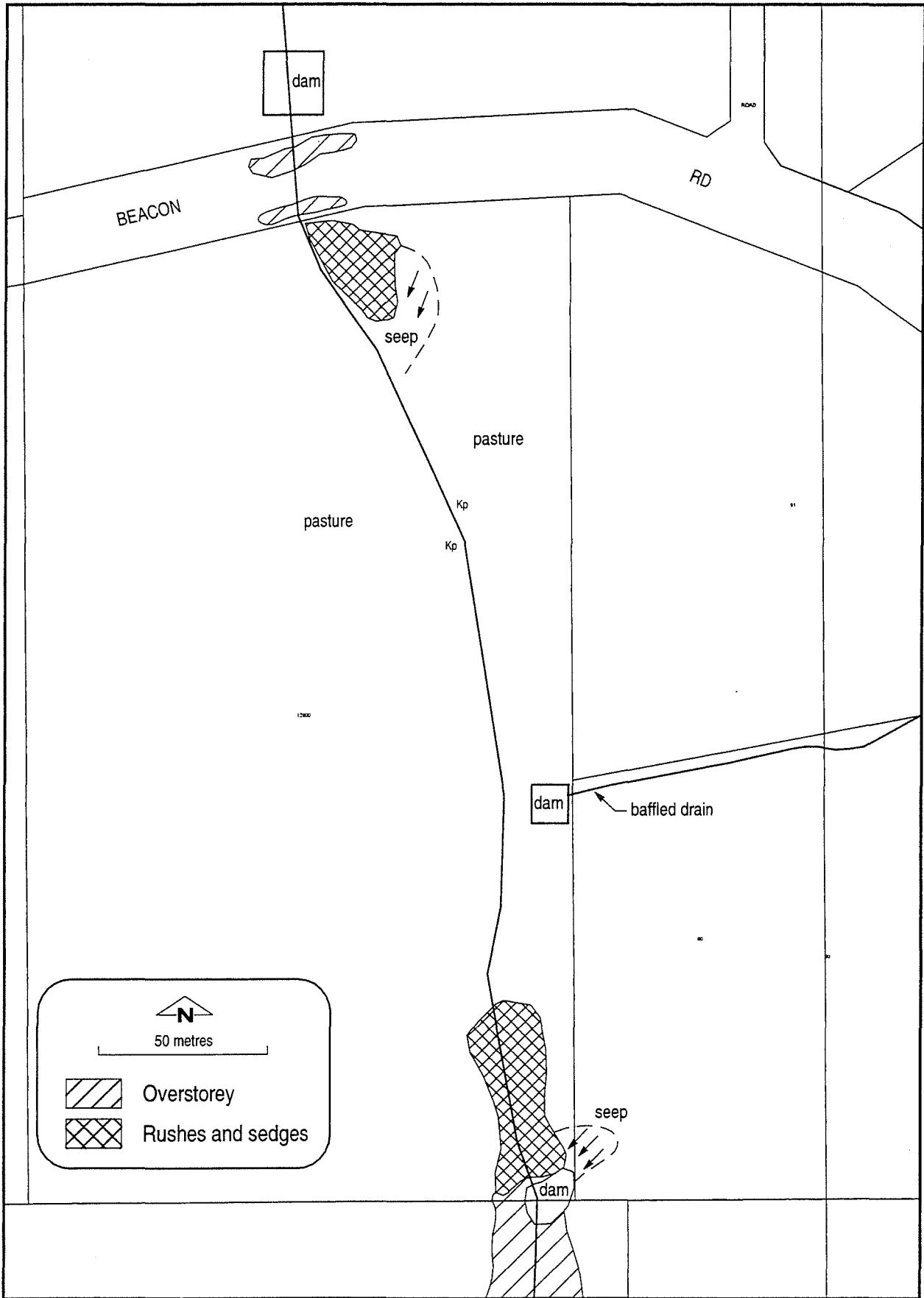
- Investigate means to obtain support such as sourcing funding, labour or materials from catchment groups in a matching funding arrangement to rehabilitate this area.
- Encourage landholders to fence off the stream from stock access at least 15 m from the top of each bank.
- Fence off each seep from stock access, and spray weeds around the *Lepidosperma* spp. to encourage their natural regeneration.
- Implement the following revegetation strategy: prepare the site to remove weed growth competition, spray the weed regrowth, then rip and implement a combined planting and direct seeding program. Use hemp matting if required on the steep banks to stabilise the area and suppress weed growth.

- Provide some instream cover, by installing branches and other debris in a manner that improves habitat and encourages instream sedimentation, without threatening bank stability.
- Revegetate the fringes and bed of the channel using appropriate species (Appendix 3).

- Implement the above strategies to establish fringing vegetation along the creek margins.
- Install some instream habitat features.

- Address the severe degradation of this waterway, through the methods recommended above.
- Liaise with landholders in the area to encourage them to become involved in landcare and catchment management issues and solutions.





Clutterbuck Creek - Beacon Road Site 10 - Map 1



4.11 Bugle Tree Creek

Kintore Road and Riley Road

Results

Foreshore Condition Survey

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



Jane – Site 11: Map 1 (Section A) Bugle Tree Creek

Length of section (m): 400 m
Recorder’s name: B Waining & N Siemon
Date surveyed: 8/6/99
Nearest road access: Kintore Road and Riley Road
Lot number(s): 406

Summary of river health:

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity	Stream Condition
Red	Yellow	Green	Yellow	Yellow
Poor	Moderate	Good	Moderate	Moderate
2	4	6	4	16

Description

Bank stability: This section of Bugle Tree Creek (Site 11, Section A), at the northern end of the site, comprises an incised channel with braided sections occurring further downstream. There is localised erosion and slumping, with significant levels of localised sedimentation, especially within the braided sections. The banks of the creek are variable, ranging from steep (>60°) along the incised section, to moderate slopes from 10-45° in the braided sections. The channel width characteristic of the incised sections is up to 1.5 m with a bank height to 6 m at the very northern limits of the section. Within the braided parts of the creek the depth is <0.3 m and the width across both braids up to 5 m. There is a fire access track crossing the creek at the southern end of Section A, that is contributing to the destabilisation of the banks at this point in the creek through localised erosion. A foot track at the northern end of the section is creating similar problems to a lesser extent.

Vegetation: There is a reasonable level of diversity of native flora along this section of the creek. However, there are a number of weed infestations. The left bank has reduced levels of diversity compared to the right, particularly along the southern extent of this section. The overstorey is relatively sparse in its proportionate

Recommended strategies

- Construct formalised crossing points for pedestrians and fire control vehicles.
- Install soft engineering devices to stabilise areas of unstable banks (Appendix 4).
- Undertake a catchment survey to determine the source(s) of excessive sediment entering the waterway. Assess peak flow rates from tributaries entering Bugle Tree Creek and investigate options for reducing the velocity and sediment load upstream wherever possible.
- Remove fringing weeds and replace with appropriate native species (Appendix 3), to aid in bank stabilisation.

- Implement removal of exotic species (refer Appendix 2) in 10 m wide nodes to ensure that there is sufficient vegetation cover to prevent erosion of the bed or banks, and to retain habitat values.



cover. Native overstorey species present include frequent *Corymbia calophylla* (Marri), and occasional *Melaleuca raphiophylla* (Swamp Paperbark) and *Eucalyptus marginata* (Jarrah). Overstorey weed species include frequent Edible Figs (*Ficus carica*) and a few occurrences of introduced Wattles (*Acacia* spp.). The middlestorey is patchy and is characterised by frequent *Dryandra sessilis* (Parrot Bush), occasional *Xanthorrhoea preissii* (Grass Tree), *Astartea fascicularis* (Common Astartea), *Acacia pulchella* (Prickly Moses) and *Agonis linearifolia* (Swamp Peppermint). Weeds within the middlestorey include abundant Blackberry (*Rubus fruticosus*), predominantly within the braided sections of the creek and frequent occurrences of Tagasaste (*Cytisus proliferus*) and Giant Reed (*Arundo donax*). The understorey is continuous, with native species comprising approximately 75% of the total species present. Native species present include occurrences of *Leucopogon* sp., *Hibbertia* sp. (Yellow Buttercups), *Acacia alata* (Winged Wattle), *Macrozamia reidleyi* (Zamia), *Pimelea* sp., *Stylidium* spp., *Hardenbergia comptoniana* (Native Wisteria) and a few species of rushes and sedges. Weeds within the understorey include abundant Watsonia (*Watsonia bulbifera*), Bridal Creeper (*Asparagus asparagoides*), frequent *Paspalum* spp., *Phalaris* spp. and Ribwort Plantain (*Plantago lanceolata*).

Stream cover: The open nature of the vegetation structure gives rise to only occasional levels of stream cover. The abundance of Blackberry and the Giant Reed within the creek provides frequent levels of exotic vegetation cover to the stream. The Edible Figs, which are deciduous, provide only seasonal cover. Within the creek, instream cover is offered by the presence of leaf litter, rocks and the vegetation noted above.

- Weed control should focus on highly invasive species including Watsonia, Bridal Creeper, Giant Reed and Blackberry. The node system will minimise the risk of works exacerbating the erosion potential of the stream bed and banks (Appendix 2).
 - Define access points for weed control works and revegetation, which minimises disturbance to any native vegetation remnants present and minimises bank disturbance.
 - Monitor the level of natural regeneration and, if necessary, support with tubestock plantings in the foreshore zone with appropriate, locally indigenous native species (Appendix 3).
 - Remove exotic trees, i.e. Edible Figs, Tagasaste and introduced Wattles as they tend to be highly invasive. Monitor for regrowth, seedlings and suckers and control regularly.
 - Repeatedly brushcut Watsonia, Paspalum and Phalaris to reduce the fire hazard presented by these species during summer.
 - Ensure that access tracks are clearly defined using bollards and woodchip guideways to discourage people from indiscriminately accessing the foreshores.
 - Install signage with information about the area and the current activities in the area.
- Retain instream cover features, such as fallen branches where they do not exacerbate bank erosion.
 - Remove deciduous trees and replace with native species planted in high density to discourage weeds.
 - Remove and control weed infestations working in manageable sized nodes.
 - Revegetate the fringe of the creek with native vegetation (Appendix 3).



Habitat diversity: It is uncertain if there is any permanent water within the creek. At the time of this survey the water depth varied from shallow (<0.1) m in the braided sections, to approximately 0.3 m in the main channel. The creek is more turbid upstream, with some of the suspended sediment being filtered out within the braided section. There is evidence of the presence of ducks, bandicoots and rabbits within this area. A variety of vegetation types provide protected basking sites suitable for terrestrial invertebrates and reptiles. Trees and rushes provide adequate nesting and roosting sites for birds. The creek has a reasonable water depth and variety of conditions to provide habitat for aquatic organisms.

Other issues: The nature of the landforms within this section suggests possible disturbance in the past, possibly linked with the old quarry setting. There is rubbish, some garden refuse and an old car body dumped in the area. Some defoliation is occurring within the Marri and Jarrah trees which may be the result of insect damage. Community groups have targeted this area to undertake weed control and revegetation activities.

- Retain instream habitat features where they do not impact on stream hydrology or bank stability.
 - Investigate the sources of sediment from the catchment and liaise with the Water and Rivers Commission and local government authority to develop remedial strategies.
 - Ensure revegetation efforts provide sufficient diversity of vegetation types.
- Consult the local government authority to determine the historical land uses of the area as dumping of unconsolidated soils from previous activity may be contributing to sediment load within the creek. Stabilise this material as required.
 - Remove rubbish, garden refuse and car body.
 - Investigate source of rubbish, attempt to reduce influx if possible and remove existing materials.
 - Consult the Department of Conservation and Land Management for expert advice on the possible causes of defoliation and address as required.

Jane – Site 11: Maps 1-2 (Section B) Bugle Tree Creek

Length of section (m): 290 m
Recorder's name: B Wainig
Date surveyed: 8/6/99
Nearest road access: Kintore Road
Lot number(s): 4, 5

Summary of river health:

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

Stream Condition
Red
Poor
6



Description

Bank stability: Bugle Creek along this section (Site 11, Section B) is dominated by the presence of a dam (approximately 160 m x 30 m). The outflow runs through a residential property, where it enters Section A. The channel is approximately 1 m wide and <1 m deep. The banks are very steep (>60°). Rocks have been used within the creekline at the outflow of the dam and where it enters Section A, which serve the purpose of bank stabilisation. The land surrounding the dam is poorly vegetated, and there is an area of bare ground at the southwestern corner of the dam. Sediment accumulating downstream may arise from this source, and loss of this material may be destabilising the bank of the dam. There is localised erosion, slumping and sedimentation.

Vegetation: The vegetation of this section contains only sparse levels of native overstorey, no middlestorey and a continuous weed dominated understorey. Isolated patches of *Corymbia calophylla* (Marri) and *Eucalyptus wandoo* (Wandoo) characterise the overstorey. There are also a number of introduced tree species on the southern margin of the dam and an orchard to the north. The understorey is dominated by pasture grasses, lawn and occasional occurrences of *Watsonia* (*Watsonia bulbifera*), Couch grass (*Cynodon dactylon*) and *Paspalum* spp. Along the fenceline to the north of the dam, *Tagasaste* (*Cytisus proliferus*) has been planted.

Stream cover: There is no stream cover offered by the fringing native vegetation of this section. The exotic grasses offer limited amounts of instream cover.

Recommended strategies

- Liaise with the landholders to encourage them to fence off the dam, construct offline watering points for stock and revegetate the dam walls.
- Provide them with the Water and Rivers Commission's "Advice to residents adjoining waterways" brochures.
- Investigate erosion control methods (Appendix 4) and restore and/or modify bank stabilisation methods particularly where the existing structures are failing.

- Revegetate the creekline and dam fringes with appropriate locally indigenous native species (Appendix 3).
- Plant some instream vegetation, such as native rushes and sedges, at the outfall of the dam to aid in sediment filtering. Use steel pegs if peak flows are likely to occur prior to plant establishment.
- Implement *Watsonia* control works on a regular basis, ensuring that the plants are poisoned prior to flowering so that seeding does not occur (Appendix 2). This will help minimise the spread of highly invasive species.
- Establish a boundary between lawn and native plant areas, and use this boundary to control the extent of such plants. This space will also act as a fire break.
- Harvest *Tagasaste* branches during flowering (prior to seeding) and feed to stock, to prevent this plant from spreading. If not currently used for fodder, encourage the landholder to remove it from the site and replace it with native species.

- Encourage the landholder to revegetate the riparian zone including the banks and instream areas.
- Retain any instream cover features such as vegetative debris.



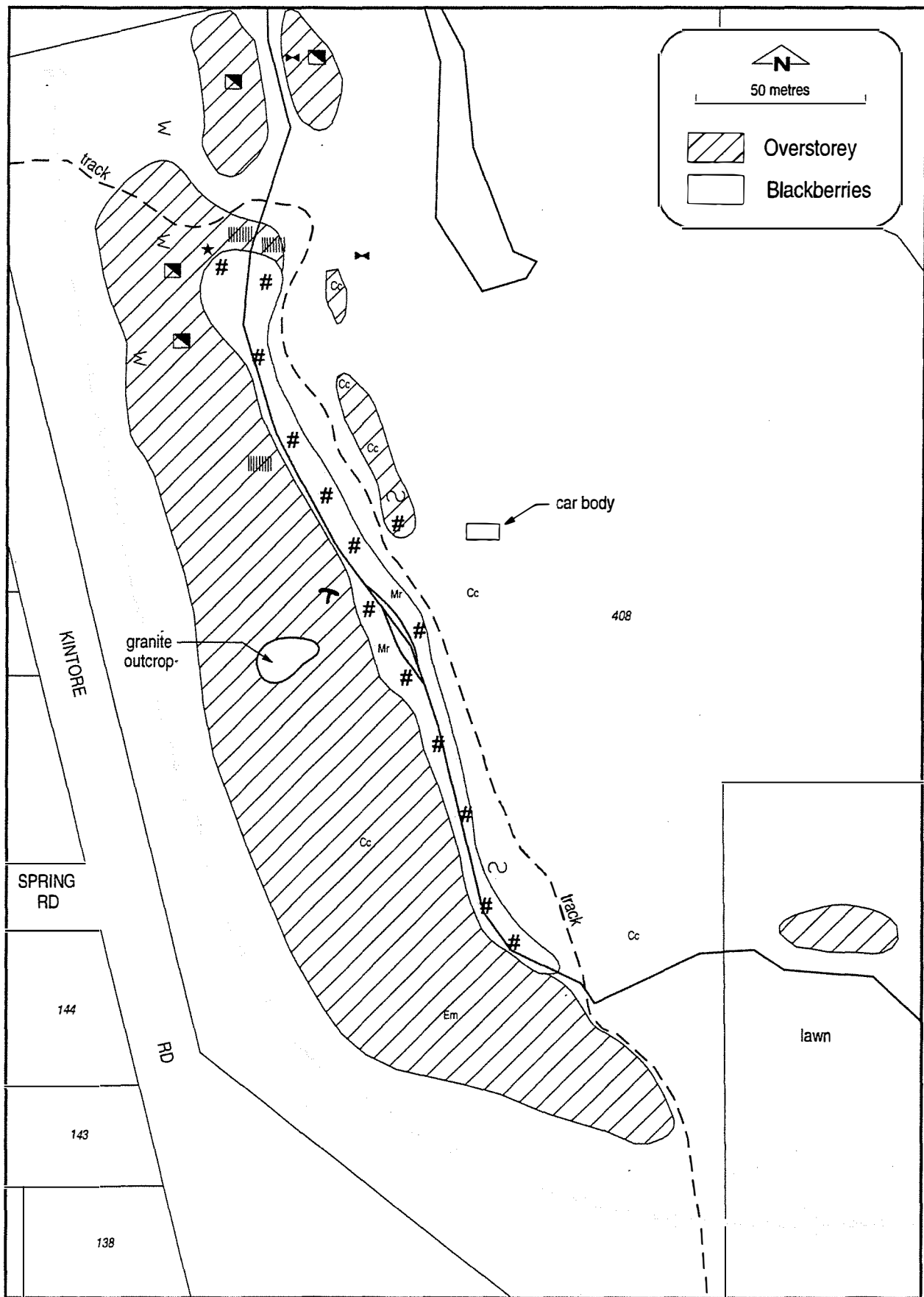
Habitat diversity: There is little in the way of habitat diversity within this section. Some protected basking sites and nesting sites may be provided by the limited occurrences of trees. The grasses along the creek, and soft substrate within the dam may provide some level of habitat value for frogs and aquatic organisms.

Other issues: The proximity of the orchard to the dam may be a source of chemical runoff to the creek. The residence near to the creek may be a source of pollutants to the creek environment.

- Revegetate with a diverse range of native vegetation.
- Retain instream habitat features.
- Encourage the landholders to plant nectar producing species to attract birds to their lot. This will improve the aesthetic appeal of their garden.

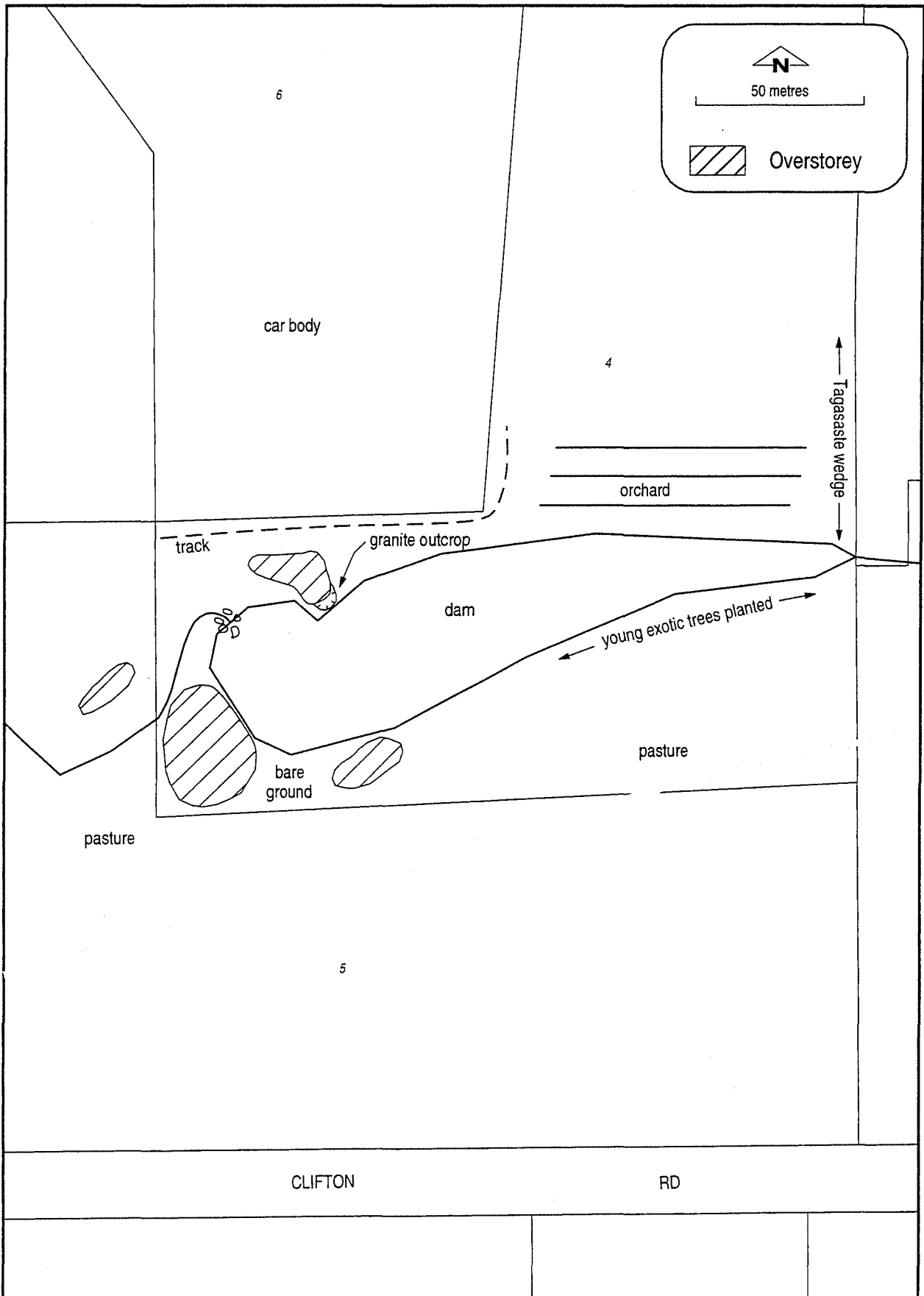
- Determine if it is possible to monitor water quality, looking for excessive levels of bacteria, herbicides and other pollutants.





Bugle Tree Creek - Kintore Road & Riley Road Site 11 - Map 1





Bugle Tree Creek - Kintore Road & Riley Road Site 11 - Map 2



4.12 Bugle Tree Creek

Gill Street and Clifton Road

Results

Foreshore Condition Survey

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



Jane – Site 12: Map 1 (Section A) Bugle Tree Creek

Length of section (m): 240 m
Recorder's name: N Siemon
Date surveyed: 9/6/99
Nearest road access: Gill Street and Clifton Road
Lot number(s): 194

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: The right bank of this section of Bugle Tree Creek (Site 12, Section A) rises on a moderate slope (10 – 45°) with a steep left bank at the upper limit of the survey area. Steep zones also occur at the culverts that direct the water flow at the property boundaries (fenceline). These culverts are surrounded by rock reinforcements (armouring) and are exacerbating scouring. Erosion and sedimentation is localised. There is minimal slumping. The channel ranges between 3 m wide at the eastern end, to 2 m at the western end.

Vegetation: The overstorey provides patchy cover and comprises *Eucalyptus marginata* (Jarrah) and *Corymbia calophylla* (Marri). The only weed species in the overstorey are Edible Figs (*Ficus carica*). The middlestorey is also patchy and comprises a mix of native and introduced species. Upstream the dominant middlestorey species is *Agonis linearifolia* (Swamp Peppermint), with occasional *Astartea fascicularis* (Common Astartea) and grades in the bushland area into a typical Jarrah/Marri forest middlestorey of *Grevillea* sp. and *Hakea* sp. The understorey is continuous and is a mosaic of dense sedges and/or weeds. Instream vegetation, both emergent (such as *Juncus pallidus*) and submerged (such as *Vallisneria*), occurs in areas with open light while limited to the emergent Angle Sword Sedge

Recommended strategies

- Liaise with the local government authority to review the effectiveness of all rock reinforcements along the creekline, and modify as required. Consider the use of box culverts, which meet the flow width of the stream.
- Install riffle structures upstream of the culverts to reduce the velocity of water entering the pipelines.
- Focus hand weeding on the Cotton Bush and Nightshade prior to flowering, ensuring that anyone undertaking its removal wears appropriate safety clothing and protects themselves from contact with the sap.
- Identify access points to the Arum Lily, Blackberry, the introduced creeper and Edible Figs and control using techniques suitable for use over wet areas (Appendix 2).
- Encourage the local landholders to control grasses and other weeds in the riparian zone during summer, to reduce the fire hazard and help stimulate natural regeneration of native species in winter.



<p>(<i>Lepidosperma tetraquetrum</i>) in the heavily shaded, dense areas of vegetation on the downstream end of the survey area. The upstream area is dominated by introduced species including annual and perennial grasses such as Couch (<i>Cynodon dactylon</i>), Guildford Grass (<i>Romulea rosea</i>) and Kikuyu (<i>Pennisetum clandestinum</i>). Blackberry (<i>Rubus fruticosus</i>), Nightshade (<i>Solanum nigrum</i>) and an unidentified creeper are the dominant weed species. There are occasional populations of Arum Lily (<i>Zantedeschia aethiopica</i>) and Cotton Bush (<i>Gomphocarpus fruticosus</i>). Downstream, the introduced creeper is the dominant understorey weed. There is deep litter cover.</p>	<ul style="list-style-type: none"> • Hand weed the introduced creeper prior to it flowering, to prevent it from becoming a problem downstream.
<p>Stream cover: The stream cover is excellent with abundant native and exotic vegetation prevalent along the streamline. Approximately 60% of the section has native sedges providing cover, while the remaining cover is provided by weed species. There are also significant levels of instream litter, rocks and branches.</p>	<ul style="list-style-type: none"> • Ensure that weed control works do not negatively impact on extensive areas of stream cover or bank stability at any time.
<p>Habitat diversity: Considerable habitat diversity characterises this section. There is permanent water retained in artificial dams, which is estimated to be more than 1 m deep, while the main channel itself is generally less than 0.3 m deep. The water is clear with some suspended clay and tannin. There is submerged vegetation in the shallows of the dams. Frogs and Pacific Ducks were present. Marron burrows were also noted.</p>	<ul style="list-style-type: none"> • Undertake weed control works to protect the integrity of the remnant vegetation in the area. • Liaise with the landholders upstream to encourage them to implement weed control which will assist natural regeneration. • Establish a water quality monitoring site focused on the sediment and nutrient load entering the waterway.
<p>Other issues: There is considerable evidence of human impact in the area including two dams with offtake pipes, rubbish, fires and point source discharge due to runoff from a poor firebreak design. There is evidence of disease. There is an orchard on the upper northern slopes of the upstream area.</p>	<ul style="list-style-type: none"> • Liaise with the landholder to improve the fire access track by installing small interceptor (contour) banks to contain runoff upslope. • Remove rubbish and discourage access by installing lockable swing gates. • Provide information to the orchardist about fertiliser and herbicide use and subsequent impacts on riparian areas. Pamphlets are available from Agriculture WA and the Water and Rivers Commission.

Jane – Site 12: Map 1 (Section B) Bugle Tree Creek

Length of section (m): 280 m
 Recorder's name: N Siemon
 Date surveyed: 9/6/99
 Nearest road access: Gill Street
 Lot number(s): 194

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: The riparian zone along Bugle Tree Creek at Site 12 (Section B) has a wide flat floodplain (up to 50 m wide) with a moderate left bank and steep right bank extending beyond that distance. There is some slumping of the land adjoining the floodplain where vegetation has been lost but, for the most part, it is heavily vegetated and stable. The streamline itself is very densely vegetated which minimises erosion, slumping and sedimentation, apart from where a crossing has been bulldozed. The channel ranges from a single channel up to 2 m wide, to an indistinct series of braided channels less than 0.5 m wide. The water depth is typically less than 0.5 m.

Vegetation: The patchy native overstorey within the floodplain consists of *Melaleuca raphiophylla* (Freshwater Paperbark). Some occasional cover is provided by mature *Corymbia calophylla* (Marri) upslope from the floodplain. Both the middlestorey and understorey are continuous and have considerable levels of weed invasion. The native sedge *Lepidosperma tetraquetrum* (Angled Sword Sedge) dominates the riparian understorey. This community is infested with weeds including Blackberry (*Rubus fruticosus*) and a perennial introduced vine. An open *Eucalyptus marginata* (Jarrah) woodland present in

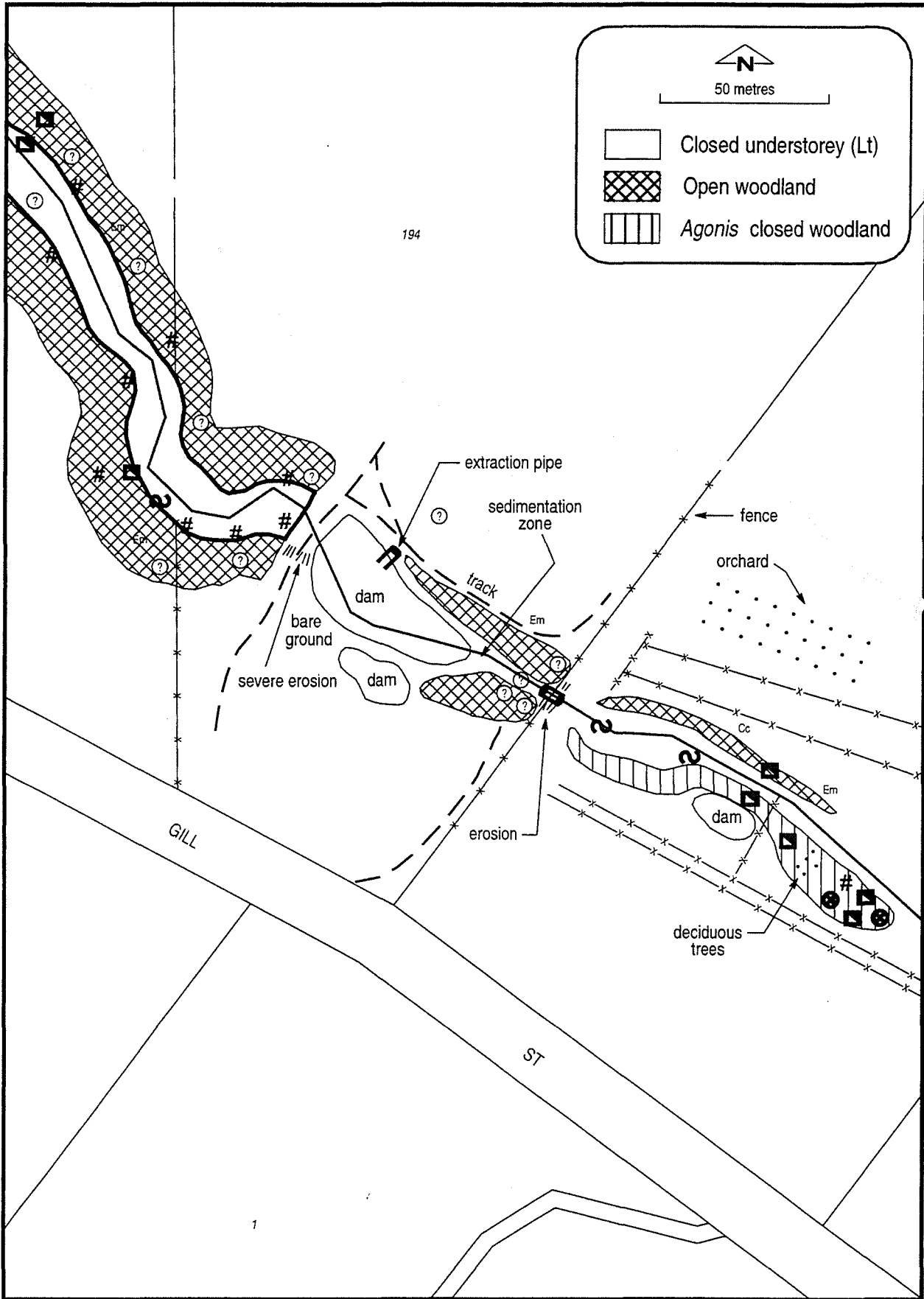
Recommended strategies

- Liaise with Fire and Emergency Services WA and the Shire to determine a more appropriate means of gaining access to the left bank, rather than destroying native vegetation.
- Following discussions with the above organisations, determine the need for a formalised crossover point for fire access.
- Implement intensive weed control, ensuring that the number of access points is minimised and that the access is focused on weedy areas.
- Liaise with the Water and Rivers Commission to assess the possibility of monitoring flows and assist with monitoring of water quality of the channel.
- Implement intensive control of Blackberry ensuring that workers select access points through weed infested areas, which minimises disturbance to the natural vegetation.
- Hand weed the perennial vine and annual grasses prior to flowering and seed set and remove from site.
- Treat any regrowth from the perennial vine with a systemic herbicide applied carefully to ensure no damage to remnant vegetation (Appendix 2).



<p>the river valley is in moderate condition. The dominant species in the understorey include <i>Macrozamia reidleyi</i> (Zamia), <i>Hakea undulata</i> (Wavy leaved Hakea), <i>H. lissocarpa</i> (Honeybush), <i>Patersonia occidentalis</i> (Purple Flag), three species of Hibbertia (Native buttercups) and occasional annual grasses. There is good litter cover.</p>	<ul style="list-style-type: none"> • Monitor for weed invasion in the Jarrah woodland, and remove immediately from site.
<p>Stream cover: There is abundant stream cover provided by both native Angle Sword Sedge and exotic species principally Blackberry. Instream debris includes rocks, branches and assorted detritus.</p>	<ul style="list-style-type: none"> • Monitor the presence of weeds and new invasions. • Ensure that weed control is undertaken following new infestations to minimise broadscale disturbance, and maintain cover.
<p>Habitat diversity: There is permanent water in this creekline. Generally the water is shallow (<0.3 m) with deeper water being limited to dam areas. The density of populations of submerged plants is indicative of higher nutrient loads than usual being experienced in the waterway. The water is generally clear, with some suspended fine clays in riffle zones. The overall habitat diversity is quite high.</p>	<ul style="list-style-type: none"> • Maintain the diverse habitat in the waterway. • Include a water quality monitoring site in any program developed by the Water and Rivers Commission in conjunction with the catchment group.
<p>Other issues: There is evidence of fire occurring at the site in the past. There is a managed fire access track (firebreak), which has been extended by bulldozing through dense vegetation across the stream to provide access to the northern bank. Dogs move through the area and may be impacting on the wildlife as dead bobtails were found on the track.</p>	<ul style="list-style-type: none"> • Install signage outlining the values of the area, and encouraging people walking dogs to keep them on leads. • Liaise with the local government authority to assess the recreational use of the area and formalise walkways to minimise indiscriminate access using bollards and/or woodchip guideways if required. • Work with management authorities to determine an improved strategy for crossing the creek to gain access during fire events, to minimise damage to the waterway.





Bugle Tree Creek - Gill Street & Clifton Road Site 12 - Map 1



4.13 Rocky Gully Creek

Results Foreshore Condition Survey

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



Jane – Site 13: Map 1 (Section A) Rocky Gully Creek

Length of section (m): 80 m
Recorder's name: B Waining and N Siemon
Date surveyed: 8/6/99
Nearest road access: Alice Road
Lot number(s): 200

Summary of river health:

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

Description

Bank stability: This section of Rocky Gully Creek (Site 13, Section A) comprises the upper reaches of the survey area. The channel is approximately 0.3 m in depth and 1 m in width, with bank slopes of between 45-60°. The foreshore banks within this section of the creek display only localised areas of erosion and sedimentation, with minimal slumping evident. There are some rocks dumped along the banks of the creek, which appear to have been placed to function as informal bank stabilisation structures. There is an area of ponding (seasonal) created upstream of the access driveway to a residence. The downstream side of this ponding shows signs of scouring at the outfall of the culvert, which runs under the driveway.

Vegetation: The vegetation along this section of the creek is reduced to a sparse overstorey dominated by *Corymbia calophylla* (Marri). The middlestorey is patchy in nature, and comprised of approximately 75% native species including occasional to infrequent *Agonis linearifolia* (Swamp Peppermint), *Acacia pulchella* (Prickly Moses), *Hakea trifurcata* (Two-Leaf Hakea) and *Viminaria juncea* (Swishbush).

Recommended Strategies

- Liaise with the local government authority to redesign outfall on downstream side of access road, to prevent further scouring from occurring by creating a riffle or open rock drop structure.
- Provide information to landholders, such as the Water and Rivers Commission pamphlets about waterways, to encourage them to take a different view of management of drainage lines.
- Encourage landholders to become involved in catchment management groups to gain advice and assistance in managing their properties.
- Construct fencing, if required, to prevent access through the creek by stock.
- Undertake revegetation of the foreshore within fenced areas using appropriate native species (Appendix 3).
- Liaise with the landholders to encourage them to revegetate the foreshore using appropriate locally derived native species (Appendix 3).
- Focus weed control on the isolated occurrences of Giant Reed, Blackberry and Watsonia, which are highly invasive, ensuring maintenance of a long term weed control effort (Appendix 2).



<p>Weeds within the middlestorey include occasional occurrences of Blackberry (<i>Rubus fruticosus</i>) and Giant Reed (<i>Arundo donax</i>). The understorey is also patchy, and contains approximately 20% native species including occasional to infrequent occurrences of native rushes and sedges, such as <i>Lepidosperma scabrum</i>, <i>L. coangustatus</i> and a dryland <i>Isolepis</i> sp. The dominant weeds include frequent <i>Watsonia</i> (<i>Watsonia bulbifera</i>), Ribwort Plantain (<i>Plantago lanceolata</i>) and Paspalum Grass (<i>Paspalum</i> spp.). There is a mixture of annual grasses within the foreshore area. There are also a number of garden plantings around the foreshore of the creek, where it runs along the front of a house and garden area.</p>	<ul style="list-style-type: none"> • Hand weed Ribwort Plantain prior to flowering and seed set and remove from site. • Brushcut Paspalum during flowering to prevent seed production to minimise the spread of this species. • Advise the landholder about the impacts of weeds on riparian health and encourage the modification of the garden features by planting out the seasonal wetland (artificially created) with indigenous rushes and sedges and establishing a boundary between lawn areas and the creekline. • Revegetate the riparian zone with native vegetation using species recommended in Appendix 3.
<p>Stream Cover: The sparse vegetation fringing the foreshore includes both native and weed species and provides only occasional stream cover. There are some deciduous trees (Poplars) which may offer only limited seasonal cover to the creekline. Within the creek there is some leaf litter, rocks, branches and occasional stands of vegetation providing cover.</p>	<ul style="list-style-type: none"> • Revegetate the foreshore to provide better stream cover using appropriate overstorey, middlestorey and understorey species (Appendix 3). • Retain instream features, such as fallen branches, to enhance instream cover where these features do not exacerbate foreshore erosion. • Replace weed species, such as Poplars, with native trees.
<p>Habitat diversity: There is no permanent water within this section of the creek. At the time of survey only minor amounts of water were present within the pond area. There is possibly sufficient variation in vegetation types to provide a variety of habitats for terrestrial invertebrates and reptiles. Frogs were heard calling from near to the pond perimeter. The creek contains sufficient meanders to provide a variety of seasonal habitat for aquatic organisms present within the section.</p>	<ul style="list-style-type: none"> • Provide dense fringing vegetation around the pond edges as habitat for frogs, reptiles and invertebrates. • Retain fallen logs/branches as habitat for terrestrial animals. • Revegetate the riparian zone with a variety of native species (Appendix 3).
<p>Other issues: There is some garden refuse and escapees within this section. The lack of regeneration of native plants suggests that grazing may be having an impact within this area. The hydrological disturbance created by the driveway and pond construction may be adversely impacting upon the bank stability along this section of the waterway. Upstream earthworks may be the source for sediment, which has been mobilised within the stream.</p>	<ul style="list-style-type: none"> • Control garden plant species and remove from foreshore zone. • Limit stock access and reduce grazing pressure, with the use of fencing where appropriate. • Investigate and stabilise upstream bank erosion to reduce sediment entering the stream.

Jane – Site 13: Map 1 (Section B) Rocky Gully Creek

Length of section (m): 170 m
Recorder's name: B Waining and N Siemon
Date surveyed: 8/6/99
Nearest road access: Alice Road
Lot number(s): 135

Summary of river health:

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

Stream Condition
Yellow
Moderate
14

Description

Bank stability: This section of Rocky Gully Creek (Site 13, Section B) exhibits a greater degree of channel incising and bank destabilisation than the upstream section. There are significant levels of erosion, with up to 50% of the surveyed section affected. There is also localised slumping and sedimentation, with up to 20% of the foreshore affected. The banks are steep (>60°) and the main channel is up to 1.5 m in depth and approximately 1 m in width. There has been some work done at the outflow of culverts, with the placement of rocks to break the flow, provide increased stability and create a riffle zone. The construction of two dams within this section also contributes to the disturbed hydrology of the creek.

Vegetation: This section of the creek foreshore is thickly vegetated. There is continuous overstorey cover, with up to 95% of the species present being native to the area including *Corymbia calophylla* (Marri), *Eucalyptus marginata* (Jarrah) and *Melaleuca raphiophylla* (Swamp Paperbark). Weeds within the overstorey such as introduced Wattles (*Acacia* spp.)

Recommended Strategies

- Revegetate the banks of the dams to reduce gully erosion down their banks using appropriate native species recommended in Appendix 3. If required use hemp matting to ensure plants are not washed away during high flow events.
- Install soft engineering devices, where applicable, to reduce the incidence of erosion and slumping (Appendix 4).
- Ensure that all weed control works take bank stability into account.
- Remove dumped rubbish and debris from the channel where it is impeding the flow.
- Liaise with the Water and Rivers Commission to investigate if dams are impacting negatively upon the whole creek health by determining environmental flows.
- Immediately implement a works program to control Water Hyacinth in the southern dam to prevent it from spreading downstream.
- Remove and control foreshore weed invasions, making sure not to further destabilise banks.



Edible Figs (*Ficus carica*) and Japanese Pepper (*Schinus terebinthifolia*) are occasional. The middlestorey is also continuous, but contains only approximately 40% native species. These include frequent *Agonis linearifolia* (Swamp Peppermint) and *Hakea undulata* (Wavy Leaved Hakea). There are also occasional to infrequent *Acacia pulchella* (Prickly Moses), *Astartea fascicularis* (Common Astartea) and *Xanthorrhoea preissii* (Grass Tree). Abundant weed species present within the middlestorey include Blackberry (*Rubus fruticosus*) and occasional introduced Bulrush (*Typha orientalis*). The understorey is also continuous with up to 50% of the cover dominated by weed species. Native species present in the understorey include frequent *Hibbertia* sp. (Yellow Buttercups), occasional *Dryandra nivea* (Couch Honeywort), *Hovea trisperma* (Common Hovea) and *Macrozamia reidleyi* (*Zamia*), while *Baumea juncea* (Bare Twig Rush) and *Schoenus grandiflorus* (Large Flowered Bog Rush) are abundant. The dominant weeds include abundant *Watsonia* (*Watsonia bulbifera*) and frequent occurrences of Bridal Creeper (*Asparagus asparagoides*), Kikuyu (*Pennisetum clandestinum*) and Paspalum Grass (*Paspalum* sp.). There are some fruit trees within the section on the outer limits of the foreshore vegetation complex. The declared noxious aquatic weed Water Hyacinth (*Eichhornia crassipes*) was present in the southern-most dam.

Stream cover: There are abundant levels of stream cover provided by the vegetation, both native and exotic, within the section due to the closed nature of the channel. There is a high frequency of instream cover offered by leaf litter, rocks, branches and vegetation within the creek channel.

Habitat diversity: There is permanent water within the dams of the section, which is turbid. The water depth increases within the creek, from upstream levels. There are ducks, evidence of bandicoots and rabbits within the area. The plethora of vegetation within this section gives rise to a wide range of habitat variation for terrestrial animals including invertebrates and reptiles. The dense nature of the vegetation also provides shelter for frogs and birds.

- Encourage the landholder to focus weed control effort on introduced Wattles, Edible Figs, Bridal Creeper and Japanese Pepper using the techniques suggested in Appendix 2.
- Advise the landholder of the benefits of controlling weeds in terms of reduced fire hazard, improved habitat for native fauna and reduced long term maintenance costs associated with managing severe infestations of the weeds present. Also advise that property values can be higher for areas that have retained their natural values.
- Repeatedly brushcut Paspalum and Kikuyu to reduce the fire hazard and rate of spread.
- Undertake localised weed control around areas retaining dense native vegetation to assist them to out-compete the weed infestations.
- Revegetate with local native plant species focusing on planting high-density nodes to make the plantings manageable (Appendix 3).

- Ensure that removal of weed species and subsequent replacement with native species maintains adequate cover.
- Retain instream features for the provision of cover where these features do not exacerbate bank erosion.

- Investigate the sources of sediment load within the creek and dams, and develop strategies to reduce the amount of sediment entering the creek.
- Retain instream habitat features.
- Approach the Department of Conservation and Land Management and Agriculture WA to obtain information on rabbit control. Implementing control of these animals will help to reduce potential impact on bank stability from burrow construction and reduce loss of tubestock.

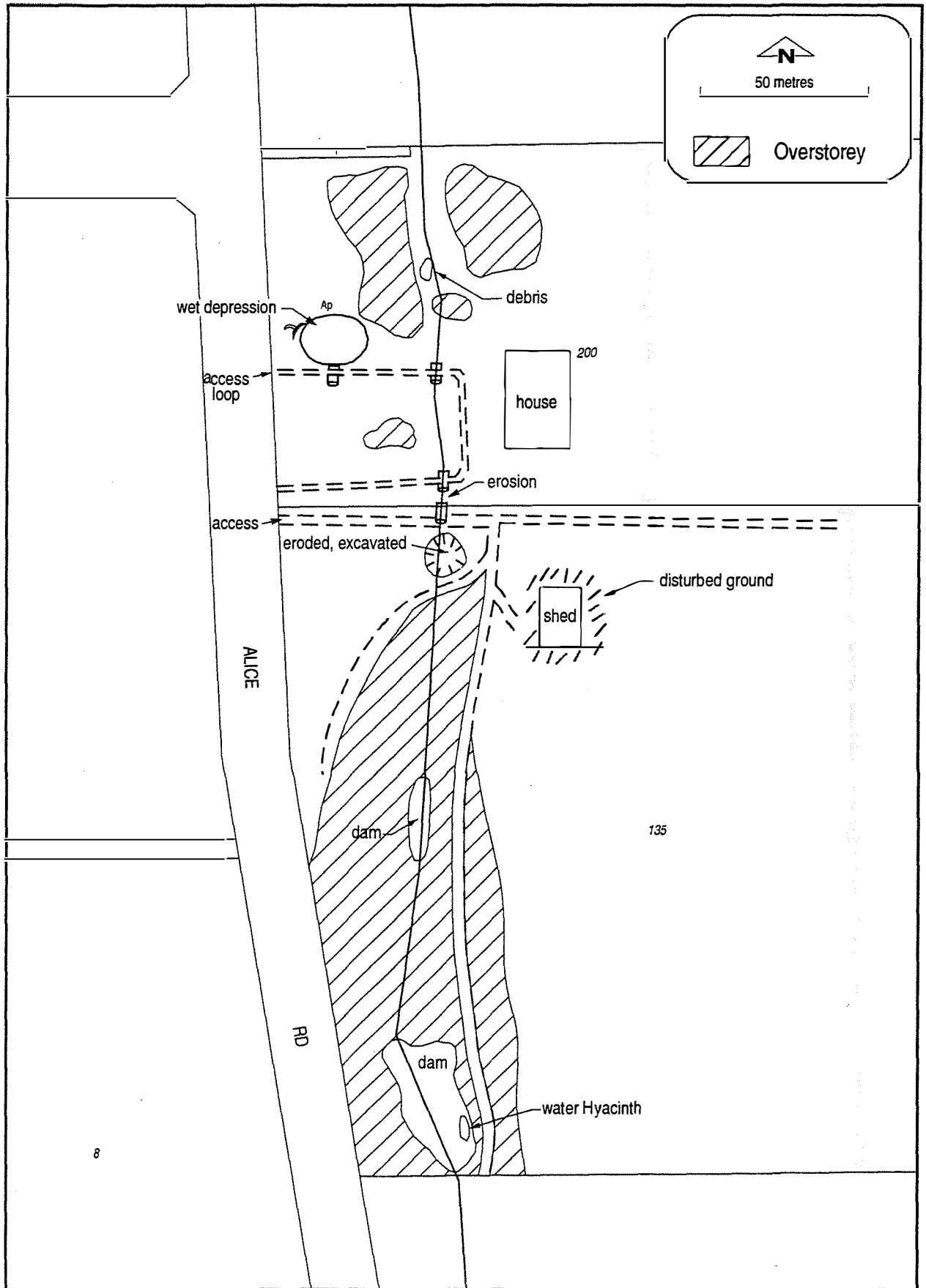


There is sufficient variation in the form of the creek to provide habitat for aquatic organisms, including features such as cascades, riffles, meanders, pools and instream cobbles.

Other issues: Rubbish is evident in the survey area, especially near the shed located upstream near the end of the surveyed section. There is some defoliation, within localised areas, possibly from insect attack. The construction of dams within the property has impacted upon the hydrology of the creek. The scouring at the culvert outfalls requires attention to reduce the amount of sediment entering the creek.

- Clean up rubbish from around the site.
- Contact the Department of Conservation and Land Management to obtain advice on identifying and addressing the cause of defoliation.
- Liaise with the local government authority to address scouring of culvert outfall issues, with the use of appropriate engineering methods of control (Appendix 4).
- Approach the landholder about the creek and the dams, to discuss options for management.

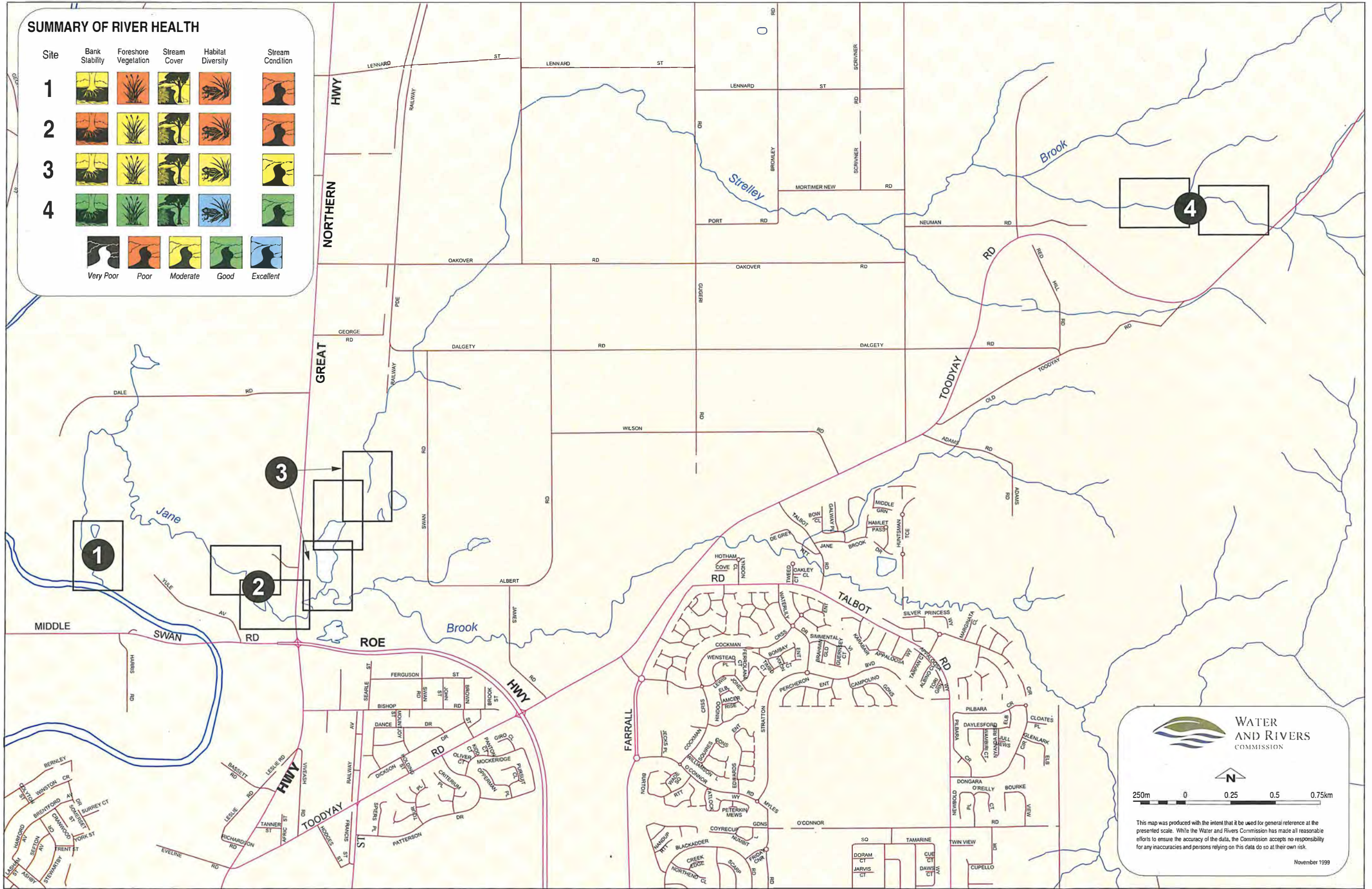




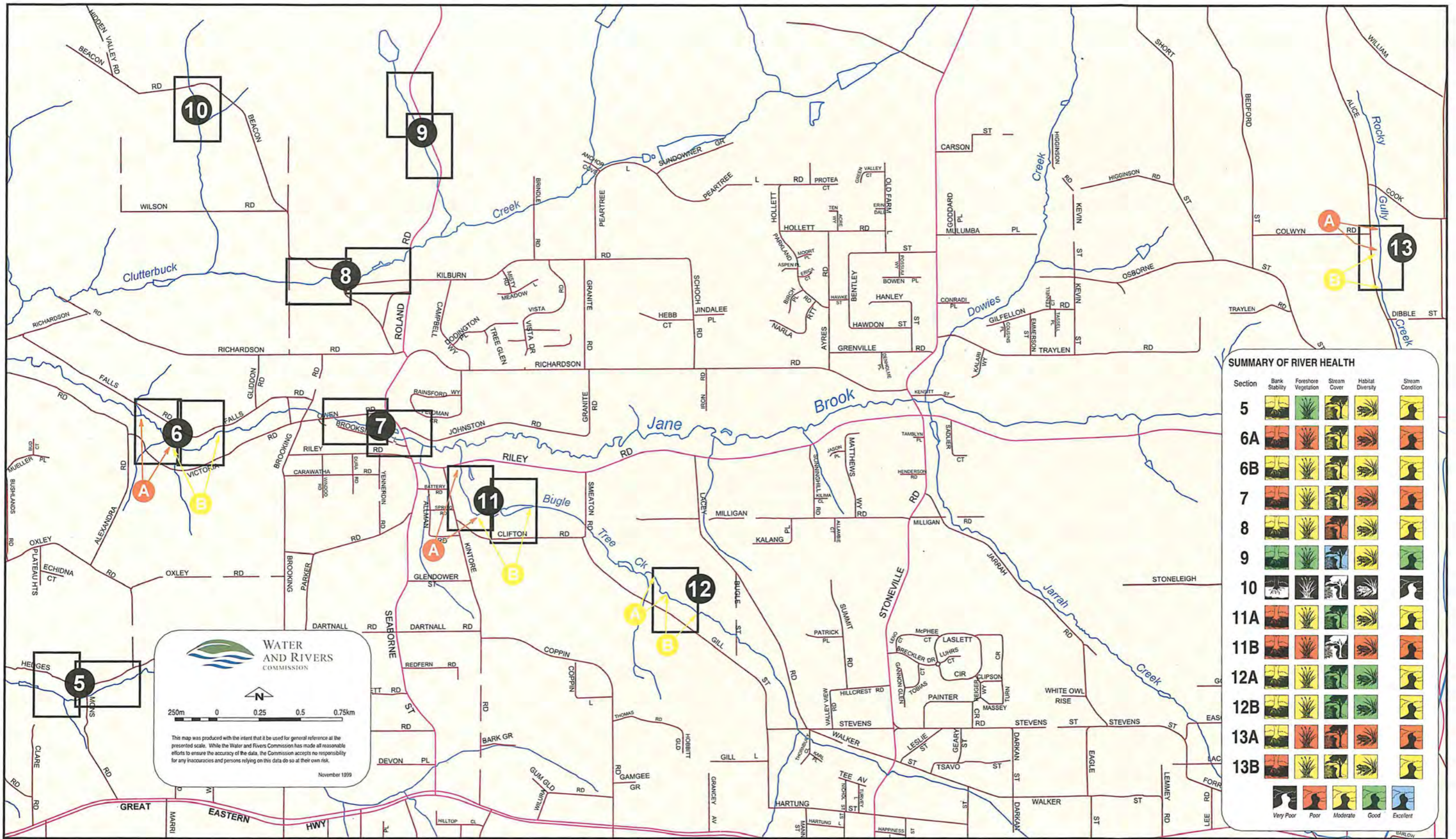
Rocky Gully Creek Site 13 - Map 1







Jane Brook Locality Map: Sites 1 to 4



Jane Brook Locality Map: Sites 5 to 13

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 potential for use of erosion control matting as an option for reducing weed re-emergence, supporting plants 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.
- Endeavour to source funds from external sources, to 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 land use

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.

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 heavy 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. Liaise with the Water and Rivers Commission and the Department of Conservation and Land Management for advice on over burning and acceptable fire levels.

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 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 Jane Brook 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 Jane Brook and its tributaries, rated in accordance with the Stream Condition Index, ranged from Very Poor to Good. Of interest is that the very poor ratings occurred in the middle sections of the catchment. The key issues requiring action in the sections surveyed are:

- poor bank stability – because of increased water volumes and loss of vegetation,
- loss of native vegetation and high levels of weed invasion,

- lack of stream cover – due to loss of fringing vegetation,
- reduced habitat diversity,
- relatively low increases to land values and reduced ability to utilise the land to earn a living, and
- managing access.

The priority weeds for control include the perennial grasses (Buffalo, Kikuyu and African Spear Grass), Weed Wattles, Watsonia, Blackberry and Bridal Creeper. There are considerable opportunities to protect remnant native vegetation through fencing, weed control and managing access for fire management and recreation.

There are also sections of the brook that have been re-contoured by private landholders and a considerable number of dams blocking the flow. The landholders need to be approached to determine the feasibility of restoring the function of the brook.

Many of the issues require all landholders 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.



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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>Cassutha</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 lissocarpha</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 stenbergiana</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 Honeymyrtle				
<i>Melaleuca viminea</i>	Mohan				
<i>Mesomelaena preissii</i>					
<i>Mesomelaena pseudosyrgia</i>					
<i>Mesomelaena stygia</i>					
<i>Mesomelaena tetragona</i>	Semaphore Sedge				
<i>Notodanthonia</i> sp.					
<i>Nuyisia 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 squamatus</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>	Variogated 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

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Species Name:	<i>Alternanthera nodiflora</i>	Control Priority	Location	Habit	Form
Common Name:	Joyweed	<div style="border: 1px solid black; padding: 2px; display: inline-block;">1</div>	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	<div style="border: 1px solid black; padding: 2px; display: inline-block;">3</div>	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:		<div style="border: 1px solid black; padding: 2px; display: inline-block;">2</div>	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

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

Common Name: Capeweed

Seed Form: Coarse seed

Seeding Time:

Method of Spread: Spreads mostly from seed

Best Time of Control: Oct - Feb

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:** 2 **Location:** Dryland Riparian Aquatic **Habit:** Bulb/Corm Perennial Annual **Form:** Tree Shrub Herb Rush/Sedge Grass Climber

Common Name: Giant reed

Seed Form: Light seed

Seeding Time: Sept - Dec

Method of Spread: Spreads readily from rhizome growth

Best Time of Control: All year

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:** 3 **Location:** Dryland Riparian Aquatic **Habit:** Bulb/Corm Perennial Annual **Form:** Tree Shrub Herb Rush/Sedge Grass Climber

Common Name: Bushy starwort

Seed Form: Light and easily spread by wind

Seeding Time:

Method of Spread: Spreads mostly from seed

Best Time of Control: Aug - Mar

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:** 2 **Location:** Dryland Riparian Aquatic **Habit:** Bulb/Corm Perennial Annual **Form:** Tree Shrub Herb Rush/Sedge Grass Climber

Common Name: Wild Oats

Seed Form: Light, easily spread by wind

Seeding Time: March - June

Method of Spread: Spreads mostly from seed

Best Time of Control: Aug - Oct

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

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Species Name:	<i>Briza maxima</i>	Control Priority	Location	Habit	Form
Common Name:	Blowfly grass	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 type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Sept - Nov		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:	June - Aug				Grass <input checked="" type="checkbox"/>
Method of Control:	Hand weeding is effective.				Climber <input type="checkbox"/>
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	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 type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Sept - Oct		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:	June - Aug				Grass <input checked="" type="checkbox"/>
Method of Control:	Hand weeding is effective.				Climber <input type="checkbox"/>
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	2	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:	Sept - Nov		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:	June - Aug				Grass <input checked="" type="checkbox"/>
Method of Control:	Hand weeding is easy and effective for small populations. The most frequently recommended treatment is Fusillade at between 2-4l per ha, when the plants are actively growing in winter. Repeated brushcutting can also be effective.				Climber <input type="checkbox"/>

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	3	Dryland <input 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 type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads readily from rhizome growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Sept - Apr				Grass <input type="checkbox"/>
Method of Control:	Dig out small infestations. Selectively spraying the leaves with a systemic herbicide can be effective.				Climber <input type="checkbox"/>

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

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Species Name:	Centaurea spp	Control Priority	Location	Habit	Form
Common Name:	Thistles	<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 type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	April - July		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:	Spring / summer				Grass <input type="checkbox"/>
Method of Control:	Hand weeding is effective for this group of plants. Vigilance is required to ensure removal prior to seeding.				
	Some people have adverse reactions to the sap and prickles of these plants. Care should be taken to minimise contact with bare skin and eyes.				

Species Name:	Chenopodium album	Control Priority	Location	Habit	Form
Common Name:	Goosefoot	<input type="checkbox"/> 3	Dryland <input 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 type="checkbox"/>
Seeding Time:	April - June and Sept - Oct		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:	All year.				Grass <input type="checkbox"/>
Method of Control:	Hand weeding is easy and effective prior to seeding.				
	Make sure that this species is correctly identified as Chenopodium glaucum is a similar native species.				

Species Name:	Conyza spp	Control Priority	Location	Habit	Form
Common Name:	Fleabane	<input type="checkbox"/> 3	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 type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	April - Dec and July - Feb		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 - Mar				Grass <input type="checkbox"/>
Method of Control:	Hand weeding is effective prior to seeding. Needs to be ongoing. Ensure any seed heads present are bagged prior to removal if hand weeding has not occurred prior to this time.				
	Common on roadsides and disturbed areas as a primary coloniser. This species is tolerant of salt, wind and is adaptable to variable soil types and therefore represents a long term problem. It is easy to control and a difference can easily be seen when controlled in bushland communities.				

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

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<i>Species Name:</i>	<i>Cortaderia selloana</i>	<i>Control Priority</i>	<i>Location</i>	<i>Habit</i>	<i>Form</i>
<i>Common Name:</i>	Pampas Grass	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
<i>Seed Form:</i>	Light and easily spread by wind		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
<i>Seeding Time:</i>	Dec - Feb		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
<i>Method of Spread:</i>	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
<i>Best Time of Control:</i>	Sept - Nov				Grass <input checked="" type="checkbox"/>
<i>Method of Control:</i>	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.				

<i>Species Name:</i>	<i>Cynodon dactylon</i>	<i>Control Priority</i>	<i>Location</i>	<i>Habit</i>	<i>Form</i>
<i>Common Name:</i>	Couch	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
<i>Seed Form:</i>	Light seed		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
<i>Seeding Time:</i>	May, April		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
<i>Method of Spread:</i>	Spreads readily from rhizome growth				Rush/Sedge <input type="checkbox"/>
<i>Best Time of Control:</i>	Oct - Feb and April - May				Grass <input checked="" type="checkbox"/>
<i>Method of Control:</i>	Hand weeding is very difficult, labour intensive and rarely effective. The most effective method is to spot/blanket spray in late spring - autumn using Fusillade 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.				

<i>Species Name:</i>	<i>Cyperus spp</i>	<i>Control Priority</i>	<i>Location</i>	<i>Habit</i>	<i>Form</i>
<i>Common Name:</i>		2	Dryland <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
<i>Seed Form:</i>	Light seed		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
<i>Seeding Time:</i>	May - July Oct - Jan		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
<i>Method of Spread:</i>	Spreads readily from rhizome growth and seed				Rush/Sedge <input checked="" type="checkbox"/>
<i>Best Time of Control:</i>	Nov - Jan				Grass <input type="checkbox"/>
<i>Method of Control:</i>	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

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

Common Name: Tree lucerne

Seed Form: Coarse seed

Seeding Time:

Method of Spread: Spreads mostly from seed

Best Time of Control: All year

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.

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

Species Name: *Dipogon lignosus* **Control Priority:** 2 **Location:** *Dryland* *Riparian* *Aquatic* **Habit:** *Bulb/Corm* *Perennial* *Annual* **Form:** *Tree* *Shrub* *Herb* *Rush/Sedge* *Grass* *Climber*

Common Name: Dolichos pea

Seed Form:

Seeding Time:

Method of Spread: Spreads from both seed and vegetative growth

Best Time of Control:

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

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:** 2 **Location:** *Dryland* *Riparian* *Aquatic* **Habit:** *Bulb/Corm* *Perennial* *Annual* **Form:** *Tree* *Shrub* *Herb* *Rush/Sedge* *Grass* *Climber*

Common Name: Barnyard grass

Seed Form: Coarse seed

Seeding Time: Oct - Dec

Method of Spread: Spreads mostly from seed

Best Time of Control: July - Sept

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.

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

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

Common Name: Paterson's curse

Seed Form: Coarse seed

Seeding Time: Nov - Jan

Method of Spread: Spreads mostly from seed

Best Time of Control: July - Oct

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.

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	1	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, April and Sept, Oct		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:	Aug - Dec				Grass <input checked="" type="checkbox"/>
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	1	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:	June - Nov		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:	Nov - March				Grass <input checked="" type="checkbox"/>
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	2	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:	June - Sept				Grass <input type="checkbox"/>
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

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Species Name:	<i>Erythrina x sykesii</i>	Control Priority	Location	Habit	Form
Common Name:	Coral Tree	2	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:			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:	Sept - Mar				Grass <input type="checkbox"/>
Method of Control:	Inject tree with systemic herbicide at 10 - 15 cm intervals around the trunk. Treatment may be required several times. Cut and paint any suckers with Glyphosate.				
	Remove any branches which fall from the tree, as these can take root. Ensure bank stability is not threatened when removing the dead trunk.				

Species Name:	<i>Ferraria crispa</i>	Control Priority	Location	Habit	Form
Common Name:	Black flag	2	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input checked="" type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Heavy seed		Riparian <input checked="" type="checkbox"/>	Perennial <input 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 by bulb or corm growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Aug - Oct				Grass <input type="checkbox"/>
Method of Control:	Hand weed using gloves as this species is highly toxic. Kings Park suggests spot spraying Glyphosate 1 in 100 for control or using Ally/Brushoff and Glean at flowering time.				

Species Name:	<i>Ficus spp.</i>	Control Priority	Location	Habit	Form
Common Name:	Edible fig tree	1	Dryland <input checked="" 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:	Dec - Mar		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 type="checkbox"/>
Method of Control:	Small plants can be removed by hand. Mature plants can be injected with full strength Glyphosate at 15 cm intervals around the trunk. Fruit removal effectively reduces the rate of spread of this weed.				

These plants are common in riparian zones. It is important not to disturb their root structure as generally these plants provide considerable bank stability in the absence of native plants. Removing the bulk of the branches and stems in dense areas may be appropriate.

Species Name:	<i>Foeniculum vulgare</i>	Control Priority	Location	Habit	Form
Common Name:	Fennel	1	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 - Feb		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:	Aug - Sept				Grass <input type="checkbox"/>
Method of Control:	Hand weeding is effective for small plants. For large plants, cut the stems below ground and remove plant material prior to fruiting to reduce future spread. Alternatively, this weed can be controlled by applying Glyphosate 1 in 100 before or at flowering or repeated brushcutting.				

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

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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

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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. Trialing 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

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

<i>Species Name:</i>	<i>Ipomoea spp</i>	<i>Control Priority</i>	<i>Location</i>	<i>Habit</i>	<i>Form</i>
<i>Common Name:</i>	Morning glory	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
<i>Seed Form:</i>			Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
<i>Seeding Time:</i>			Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
<i>Method of Spread:</i>	Spreads from both seed and vegetative growth				Rush/Sedge <input type="checkbox"/>
<i>Best Time of Control:</i>					Grass <input type="checkbox"/>
<i>Method of Control:</i>	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.

<i>Species Name:</i>	<i>Isolepis proflera</i>	<i>Control Priority</i>	<i>Location</i>	<i>Habit</i>	<i>Form</i>
<i>Common Name:</i>	Budding club rush	2	Dryland <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
<i>Seed Form:</i>	Light seed		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
<i>Seeding Time:</i>	Dec - Feb		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
<i>Method of Spread:</i>	Spreads from both seed and vegetative growth				Rush/Sedge <input checked="" type="checkbox"/>
<i>Best Time of Control:</i>	Winter				Grass <input type="checkbox"/>
<i>Method of Control:</i>	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

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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

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Species Name:	Lantana camara	Control Priority	Location	Habit	Form
Common Name:	Lantana	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	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	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	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

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Species Name: *Medicago spp* **Control Priority** 3 **Location** **Habit** **Form**

Common Name: Medics Dryland Bulb/Corm Tree
 Riparian Perennial Shrub
 Aquatic Annual Herb
 Rush/Sedge
 Grass
 Climber

Seed Form: Light seed

Seeding Time:

Method of Spread: Spreads mostly from seed

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** 3 **Location** **Habit** **Form**

Common Name: Dryland Bulb/Corm Tree
 Riparian Perennial Shrub
 Aquatic Annual Herb
 Rush/Sedge
 Grass
 Climber

Seed Form:

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: *Myrsiphyllum asparagoides* **Control Priority** 1 **Location** **Habit** **Form**

Common Name: Bridal Creeper Dryland Bulb/Corm Tree
 Riparian Perennial Shrub
 Aquatic Annual Herb
 Rush/Sedge
 Grass
 Climber

Seed Form: Light seed

Seeding Time: Oct - Dec

Method of Spread: Spreads from both seed and vegetative growth

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** 2 **Location** **Habit** **Form**

Common Name: Jonquil Dryland Bulb/Corm Tree
 Riparian Perennial Shrub
 Aquatic Annual Herb
 Rush/Sedge
 Grass
 Climber

Seed Form: Coarse seed

Seeding Time:

Method of Spread: Spreads by bulb or corm growth

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

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Species Name:	<i>Nerium oleander</i>	Control Priority	Location	Habit	Form
Common Name:	Oleander	<input type="checkbox"/> 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 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:	All year				Grass <input type="checkbox"/>
Method of Control:	Dig out the individual plants. Otherwise cut the stumps and paint with full strength systemic herbicide.				
					Climber <input type="checkbox"/>

Species Name:	<i>Olea europaea</i>	Control Priority	Location	Habit	Form
Common Name:	Olive tree	<input type="checkbox"/> 2	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input checked="" type="checkbox"/>
Seed Form:	Heavy seed		Riparian <input type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Nov - Jan		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:					Grass <input type="checkbox"/>
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"/>	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:	Sept		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads by runners				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	July - Sept				Grass <input type="checkbox"/>
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"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:			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 type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:					Grass <input checked="" type="checkbox"/>
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

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Species Name: *Paspalum spp* **Control Priority:** 2 **Location:** Dryland Riparian Aquatic **Habit:** Bulb/Corm Perennial Annual **Form:** Tree Shrub Herb Rush/Sedge Grass Climber

Common Name: Paspalum

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: *Pelargonium capitatum* **Control Priority:** 1 **Location:** Dryland Riparian Aquatic **Habit:** Bulb/Corm Perennial Annual **Form:** Tree Shrub Herb Rush/Sedge Grass Climber

Common Name: Rose pelargonium

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 Aly/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: *Pennisetum clandestinum* **Control Priority:** 1 **Location:** Dryland Riparian Aquatic **Habit:** Bulb/Corm Perennial Annual **Form:** Tree Shrub Herb Rush/Sedge Grass Climber

Common Name: Kikuyu

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: *Plantago lanceolata* **Control Priority:** 3 **Location:** Dryland Riparian Aquatic **Habit:** Bulb/Corm Perennial Annual **Form:** Tree Shrub Herb Rush/Sedge Grass Climber

Common Name: Ribwort plantain

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

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Species Name:	Populus spp	Control Priority	Location	Habit	Form
Common Name:	Poplar	<input type="checkbox"/> 2	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input checked="" type="checkbox"/>
Seed Form:			Riparian <input 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:	Oct - Feb				Grass <input type="checkbox"/>
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"/>	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		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 - Nov				Grass <input type="checkbox"/>
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:	Rhynchosyrum repens	Control Priority	Location	Habit	Form
Common Name:	Red natal grass	<input type="checkbox"/> 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:	Sept - Nov		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:	June to Aug				Grass <input checked="" type="checkbox"/>
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"/>	Bulb/Corm <input type="checkbox"/>	Tree <input checked="" type="checkbox"/>
Seed Form:	Heavy seed		Riparian <input type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Nov - Jan		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:	Any time but best prior to fruiting				Grass <input type="checkbox"/>
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

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

Common Name: Guildford grass

Seed Form: Light seed

Seeding Time:

Method of Spread: Spreads by bulb or corm growth

Best Time of Control:

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:** 2 **Location:** *Dryland* *Riparian* *Aquatic* **Habit:** *Bulb/Corm* *Perennial* *Annual* **Form:** *Tree* *Shrub* *Herb* *Rush/Sedge* *Grass* *Climber*

Common Name: Watercress

Seed Form: Light seed

Seeding Time:

Method of Spread: Spreads from both seed and vegetative growth

Best Time of Control: Access dependent

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:** 1 **Location:** *Dryland* *Riparian* *Aquatic* **Habit:** *Bulb/Corm* *Perennial* *Annual* **Form:** *Tree* *Shrub* *Herb* *Rush/Sedge* *Grass* *Climber*

Common Name: Blackberry

Seed Form: Heavy seed

Seeding Time:

Method of Spread: Spreads from both seed and vegetative growth

Best Time of Control: Dec - April

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

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Species Name:	Rumex spp	Control Priority	Location	Habit	Form
Common Name:	Dock	<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 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 and easily spread by wind				
Seeding Time:	March - June				
Method of Spread:	Spreads mostly from seed				
Best Time of Control:	Nov - Mar				
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	<input type="checkbox"/> 1	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 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:					
Method of Spread:	Spreads from suckers				
Best Time of Control:	Dec - Mar				
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 terebinthifolia	Control Priority	Location	Habit	Form
Common Name:	Japanese pepper	<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:	Coarse seed				
Seeding Time:	Sept				
Method of Spread:	Spreads from suckers and seed				
Best Time of Control:	All year, but in wetlands treat in summer				
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

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

Common Name: Deadly nightshade 1 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: Sept - Oct Grass

Method of Control: Hand weed small infestations. Kings Park Board recommends using Glyphosate 1 in 100. Desiccant herbicides applied to all parts of the plant can be effective on warm to hot days. Climber

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

Common Name: Staggerweed 3 Dryland Bulb/Corm Tree

Seed Form: Heavy seed Riparian Perennial Shrub

Seeding Time: Aquatic Annual Herb

Method of Spread: Spreads mostly from seed Rush/Sedge

Best Time of Control: Grass

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. Climber

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

Seed Form: Sterile or non seed producing Riparian Perennial Shrub

Seeding Time: Aquatic Annual Herb

Method of Spread: Spreads readily from rhizome growth Rush/Sedge

Best Time of Control: Aug - Sept Grass

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. Climber

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

Seed Form: Light, easily spread by wind Riparian Perennial Shrub

Seeding Time: All year round Aquatic Annual Herb

Method of Spread: Spreads mostly from seed Rush/Sedge

Best Time of Control: Sept - Nov Grass

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. Climber

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

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Species Name: *Thunbergia alata* **Control Priority:** **Location:** **Habit:** **Form:**

Common Name: Black-eyed Susan 2 Dryland Bulb/Corm Tree

Seed Form: Coarse seed 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: Remove small plants manually. Spot spraying with Glyphosate at a rate of 1 in 50 can be effective. Climber

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: *Trifolium spp.* **Control Priority:** **Location:** **Habit:** **Form:**

Common Name: Clovers 3 Dryland Bulb/Corm Tree

Seed Form: Heavy seed Riparian Perennial Shrub

Seeding Time: Aquatic Annual Herb

Method of Spread: Spreads mostly from seed Rush/Sedge

Best Time of Control: Grass

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. Climber

Species Name: *Tropaeolum majus* **Control Priority:** **Location:** **Habit:** **Form:**

Common Name: Nasturtium 3 Dryland Bulb/Corm Tree

Seed Form: Heavy seed Riparian Perennial Shrub

Seeding Time: Nov - Jan Aquatic Annual Herb

Method of Spread: Spreads mostly from seed Rush/Sedge

Best Time of Control: Aug / Sept Grass

Method of Control: Removing this species by hand is effective. Selectively applying Glyphosate 1 in 100 can be effective. Climber

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

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Species Name: *Typha orientalis* **Control Priority** **Location** **Habit** **Form**

Common Name: Bulrush 1 Dryland Bulb/Corm Tree

Seed Form: Light, easily spread by wind Riparian Perennial Shrub

Seeding Time: Aquatic Annual Herb

Method of Spread: Spreads readily from rhizome growth and seed Rush/Sedge

Best Time of Control: Winter Grass

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. Climber

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** **Location** **Habit** **Form**

Common Name: Ursinia 3 Dryland Bulb/Corm Tree

Seed Form: Light seed Riparian Perennial Shrub

Seeding Time: Aquatic Annual Herb

Method of Spread: Rush/Sedge

Best Time of Control: Grass

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

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

Species Name: *Vicia sativa* **Control Priority** **Location** **Habit** **Form**

Common Name: Vetch 3 Dryland Bulb/Corm Tree

Seed Form: Heavy seed 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: Kings Park recommends trying Glyphosate 75ml in 15 l when the plants are actively growing. Hand weeding small populations is possible and effective. Climber

Species Name: *Vinca major* **Control Priority** **Location** **Habit** **Form**

Common Name: Periwinkle 3 Dryland Bulb/Corm Tree

Seed Form: Coarse seed Riparian Perennial Shrub

Seeding Time: Aquatic Annual Herb

Method of Spread: Spreads by runners Rush/Sedge

Best Time of Control: June - Aug Grass

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

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

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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:	Spreads by bulb/corm growth				
	Climber <input type="checkbox"/>				

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 Glean and Ally/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:	Spreads from both seed and vegetative growth				
	Climber <input type="checkbox"/>				

Method of Control: Entire plants can be removed by digging - make sure to remove all of the rhizome. Spot spray from April to Novemer using Glyphosate 1 in 100 or Gleen Ally/Brushhoff 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

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Appendix 3

Suggested species for revegetation works



Appendix 3: Suggested species for revegetation works

Species	CommonName	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="radio"/>	<input type="radio"/>	<input type="radio"/>
<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="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
<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 checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
<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 checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
<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="radio"/>	<input type="radio"/>	<input type="radio"/>
<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="radio"/>	<input type="radio"/>	<input type="radio"/>
<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 type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
<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 checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
<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 checked="" type="checkbox"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
<u>2. Compact tree</u>												
<i>Eucalyptus todtiana</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 checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
<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="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
<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 type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
<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 type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
<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 checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
<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="radio"/>	<input type="radio"/>	<input type="radio"/>
<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 type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
<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 checked="" type="checkbox"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
<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="radio"/>	<input type="radio"/>	<input type="radio"/>
<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 type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
<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 type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>

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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 type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<u>4. Medium shrub</u>												
<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 type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<i>Darwinia citriodora</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 checked="" type="checkbox"/>	<input checked="" 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 stembergia</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 checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" 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 checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Melaleuca lateralis</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 type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" 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 type="checkbox"/>	<input type="checkbox"/>	<input checked="" 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 checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<i>Pteridium esculentum</i>	Bracken fern	<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>Regelia ciliata</i>	Regelia	<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"/>	<input checked="" 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"/>
<u>5. Low shrub</u>												
<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 checked="" 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 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 checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" 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 checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Gompholobium tomentosum</i>	Halry 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 checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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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 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 candidans</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"/>

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Species	Common Name	Location						Habitat			
		Roley Pool	Wright Brook	Breem Brook	Bannister Creek	Emmett 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 checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Bolboschoenus caldwelii</i>	Marsh club rush	<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"/>	<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 type="checkbox"/>	<input checked="" type="checkbox"/>	<input 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 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 type="checkbox"/>	<input 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 type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Eleocharis acuta</i>	Spike sedge	<input type="checkbox"/>	<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 checked="" type="checkbox"/>
<i>Isolepis nodosa</i>	Knotted Club sedge	<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 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 type="checkbox"/>	<input type="checkbox"/>	<input 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 type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input 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 type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Juncus pallidus</i>	Pale rush	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input 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 type="checkbox"/>	<input checked="" type="checkbox"/>	<input 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 type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Lepidosperma longitudinale</i>	Pithy sword sedge	<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 checked="" type="checkbox"/>	<input type="checkbox"/>
<i>Lepidosperma tetraquetrum</i>	Angle sword sedge	<input checked="" 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 checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Restio spp</i>		<input type="checkbox"/>	<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 type="checkbox"/>
<i>Schoenoplectus validus</i>	Lake Club Sedge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

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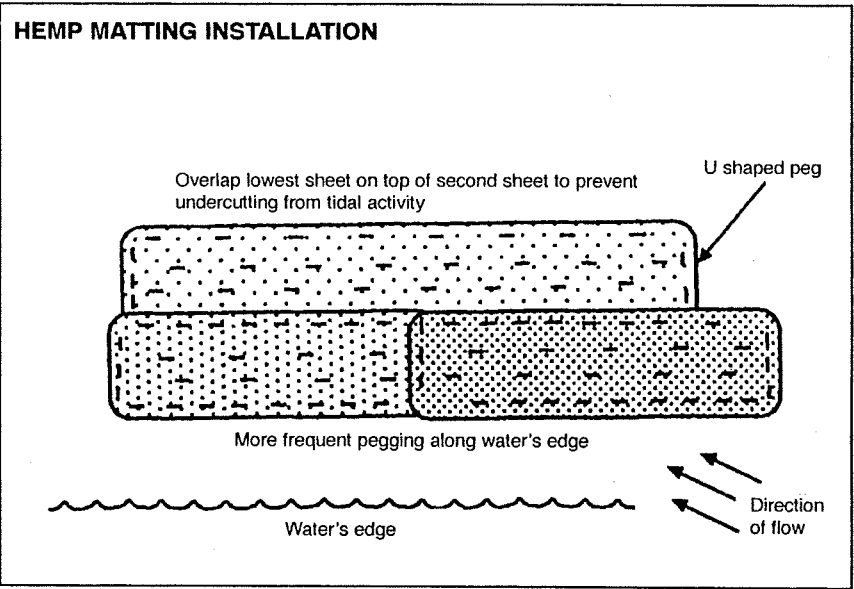
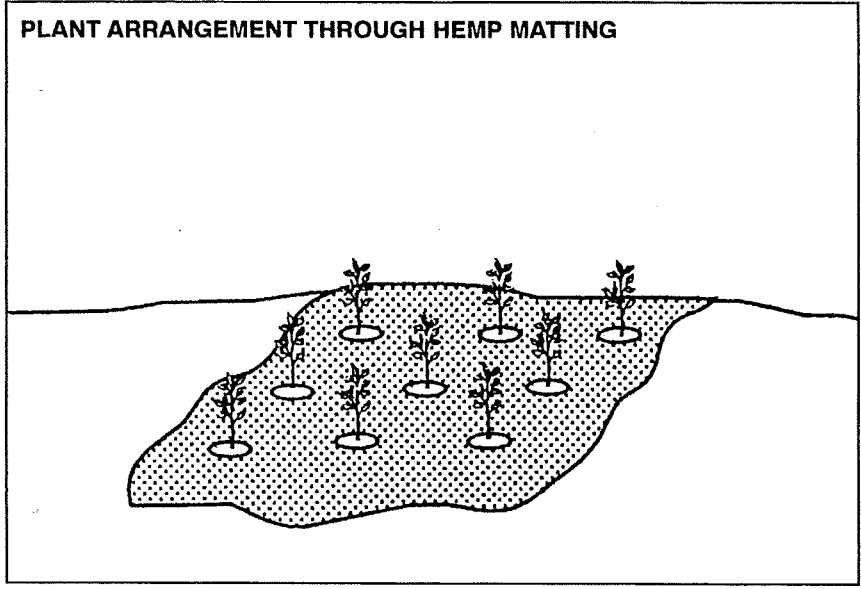
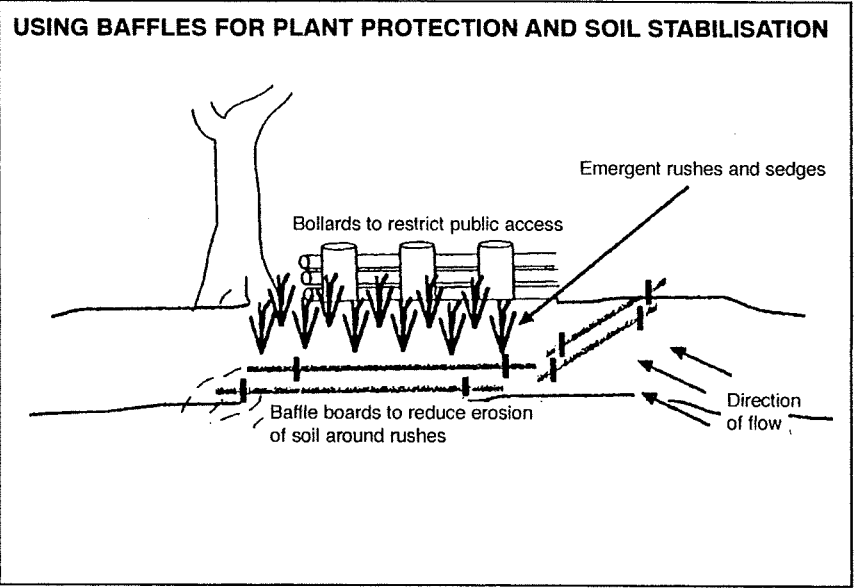
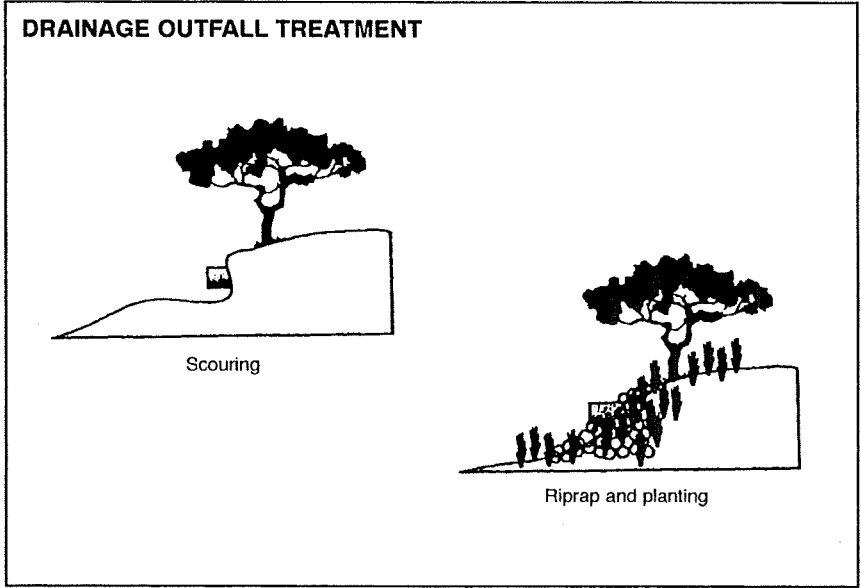


Appendix 4

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>
7	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>
W	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 sternbergiana</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